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PANASONIC CT-13R18B SERVICE MANUAL

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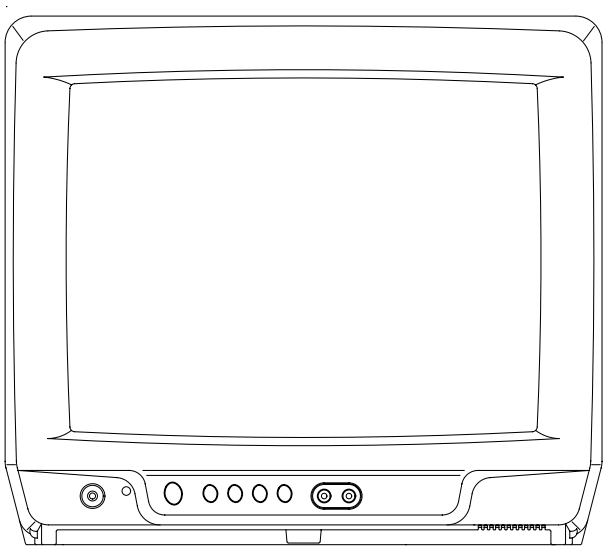
Service Manual

Color Television

Main Manual



Panasonic

Models	Chassis
CT-13R18B	TMC573
CT-13R38S	TMC573
CT-13R28W	TMC573

This service manual is issued as a service guide for the models listed above.
Included in this manual are a set of schematic, block diagrams, functional descriptions, alignment procedures, disassembly procedures and a complete parts list.

"**WARNING!** This Service Manual is designed for experienced repair technicians only and is not designed for use by the general public.
It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product.
Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the product or products dealt with in this Service Manual by anyone else could result in serious injury or death."

The service technician is required to read and follow the **"Safety Precautions" and "Important Safety Notice"** in this Main Manual.

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Important Safety Notice

Special components are used in this television set which are important for safety. These parts are identified on the schematic diagram by the symbol ⚠ and printed in **BOLD TYPE** on the replacement part list. It is essential that these critical parts are replaced with the manufacturer's specified replacement part to prevent X-ray radiation, shock, fire or other hazards. Do not modify the original design without the manufacturer's permission.

Safety Precautions

General Guidelines

An **Isolation Transformer** should always be used during the servicing of a receiver whose chassis is not isolated from AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks. It will also protect the Receiver from being damaged by accidental shorting that may occur during servicing.

When servicing, observe the original lead dress, especially in the high voltage circuit. Replace all damaged parts (also parts that show signs of overheating.)

Always Replace Protective Devices, such as fishpaper, isolation resistors and capacitors, and shields after servicing the Receiver. Use only manufacturer's recommended rating for fuses, circuits breakers, etc.

High potentials are present when this Receiver is operating. Operation of the Receiver without the rear cover introduces danger for electrical shock. Servicing should not be performed by anyone who is not thoroughly familiar with the necessary precautions when servicing high-voltage equipment.

Extreme care should be practiced when **Handling the Picture Tube.** Rough handling may cause it to implode due to atmospheric pressure. (14.7 lbs per sq. in.). Do not nick or scratch the glass or subject it to any undue pressure. When handling, use safety goggles and heavy gloves for protection. **Discharge the picture tube** by shorting the anode to chassis ground (not to the cabinet or to other mounting hardware). When discharging connect cold ground (i.e. dag ground lead) to the anode with a well insulated wire or use a grounding probe.

Avoid prolonged exposure at close range to unshielded areas of the picture tube to prevent exposure to X-ray radiation.

The **Test Picture Tube** used for servicing the chassis at the bench should incorporate safety glass and magnetic shielding. The safety glass provide shielding for the tube viewing area against X-ray radiation as well as implosion. The magnetic shield limits the X-ray radiation around the bell of the picture tube in addition to the restricting magnetic effects. When using a picture tube test jig for service, ensure that the jig is capable of handling **50kV** without causing X-ray radiation.

Before returning a serviced receiver to the owner, the service technician must thoroughly test the unit to ensure that is completely safe to operate. **Do not use a line isolation transformer when testing.**

Leakage Current Cold Check

Unplug the AC cord and connect a jumper between the two plug prongs.

Measure the resistance between the jumpered AC plug and expose metallic parts such as screwheads, antenna terminals, control shafts, etc. If the exposed metallic part has a return path to the chassis, the reading should be between 240kΩ and 5.2MΩ. If the exposed metallic part does not have a return path to the chassis, the reading should be infinite.

Leakage Current Hot Check (Fig. 1)

Plug the AC cord directly into the AC outlet. Do not use an isolation transformer during the check.

Connect a 1.5kΩ 10 watt resistor in parallel with a 0.15µF capacitor between an exposed metallic part and ground. Use earth ground, for example a water pipe.

Using a DVM with a 1000 ohms/volt sensitivity or higher, measure the AC potential across the resistor.

Repeat the procedure and measure the voltage present with all other exposed metallic parts.

Verify that any potential does not exceed 0.75 volt RMS. A leakage current tester (such a Simpson Model 229, Sencore Model PR57 or equivalent) may be used in the above procedure, in which case any current measure must not exceed 0.5 milliamp. If any measurement is out of the specified limits, there is a possibility of a shock hazard and the Receiver must be repaired and rechecked before it is returned to the customer.

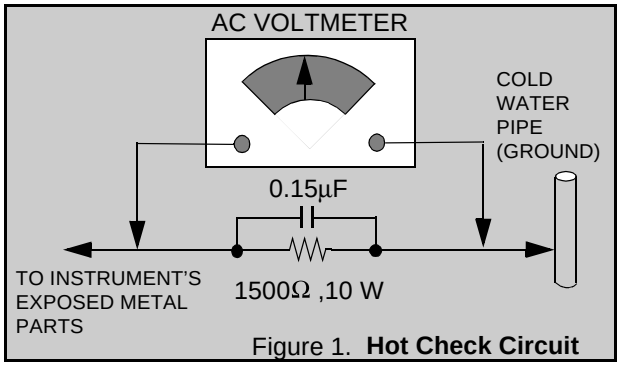


Figure 1. **Hot Check Circuit**

X-ray Radiation

WARNING: The potential source of X-ray radiation in the TV set is in the High Voltage section and the picture

Note: *It is important to use an accurate, calibrated high voltage meter.*

Set the **brightness and picture** controls to Minimum. Measure the High Voltage. The high voltage should be **24.5 ± 1.0kV.** If the upper limit is out of tolerance, immediate service and correction is required to insure safe operation and to prevent the possibility of premature component failure.

Service Notes

Note: These components are affixed with glue. Be careful not to break or damage any foil under the component or at the pins of the ICs when removing. Usually applying heat to the component for a short time while twisting with tweezers will break the component loose.

Leadless Chip Component (surface mount)

Chip components must be replaced with identical chips due to critical foil track spacing. There are no holes in the board to mount standard transistors or diodes. Some chips capacitor or resistor board solder pads may have holes through the board, however the hole diameter limits standard resistor replacement to 1/8 watt. Standard capacitor may also be limited for the same reason. It is recommended that identical components be used.

Chip resistor have a three digit numerical resistance code - 1st and 2nd significant digits and a multiplier.

Example: 162 = 1600 or 1.6kΩ resistor, 0 = 0Ω (jumper).

Chip capacitors generally do not have the value indicated on the capacitor. The color of the component indicates the general range of the capacitance.

Chip transistors are identified by a two letter code. The first letter indicates the type and the second letter, the grade of transistor.

Chip diodes have a two letter identification code as per the code chart and are a dual diode pack with either common anode or common cathode. Check the parts list for correct diode number.

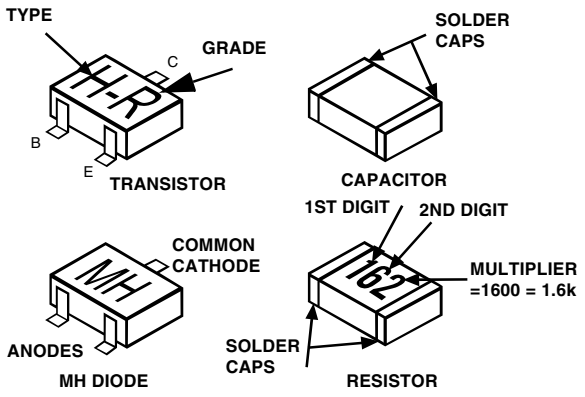
Component Removal

1. Use solder wick to remove solder from component end caps or terminal.
2. Without pulling up, carefully twist the component with tweezers to break the adhesive.
3. Do not reuse removed leadless or chip components since they are subject to stress fracture during removal.

Chip Component Installation

1. Put a small amount of solder on the board soldering pads.
2. Hold the chip component against the soldering pads with tweezers or with a miniature alligator clip and apply heat to the pad area with a 30 watt iron until solder flows. Do not apply heat for more than 3 seconds.

Chip Components

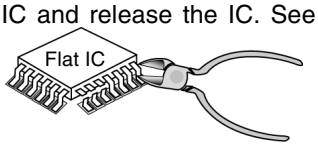


How to Replace Flat-IC

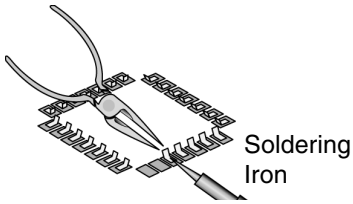
- Required Tools -

- Soldering iron
- Needle nose pliers
- Wire cutters (sharp & small)
- De-solder braids
- Magnifier

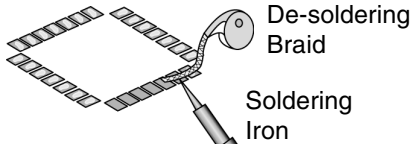
1. Cut the pins of a defective IC with wire cutters. Remove IC from board. If IC is glued to the board, heat the IC and release the IC. See Note above.



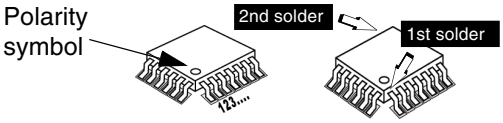
2. Using soldering iron and needle nose pliers remove the IC pins from the board.



3. Using de-soldering braid and soldering iron remove solder from affected are on board (pads).

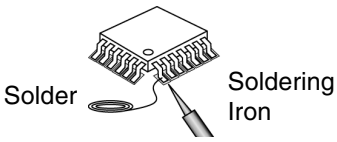


4. Position the new Flat-IC in place (apply the pins of the Flat-IC to the soldering pads where the pins need to be soldered). Determine the positions of the soldering pads and pins by correctly aligning the polarity symbol. Solder pin #1 first, align the IC.

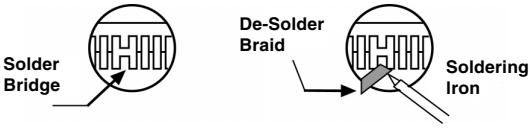


Solder the pin opposite to pin #1. This will assist positioning the IC.

5. Solder all pins to the soldering pads using a fine tipped soldering iron.



6. Check with a magnifier for solder bridge between the pins or for dry joint between pins and soldering pads. To remove a solder bridge, use a de-solder braid as shown in the figure below.



Service Notes (Continued)

IMPORTANT: To protect against possible damage to the solid state devices due to arcing or static discharge, make certain that all ground wires and CTR DAG wire are securely connected.

CAUTION: The power supply circuit is above earth ground and the chassis cannot be polarized. Use an isolation transformer when servicing the Receiver to avoid damage to the test equipment or to the chassis. Connect the test equipment to the proper ground (⏚) or (⏚) when servicing, or incorrect voltages will be measured.

WARNING: This Receiver has been designed to meet or exceed applicable safety and X-ray radiation protection as specified by government agencies and independent testing laboratories.

To maintain original product safety design standards relative to X-ray radiation and shock and fire hazard, parts indicated with the symbol ⚠ on the schematic must be replaced with identical parts. Order parts from the manufacturer's parts center using the parts numbers shown in this service manual, or provide the chassis number and the part reference number.

For optimum performance and reliability, all other parts should be replaced with components of identical specification.

About lead free solder (PbF)

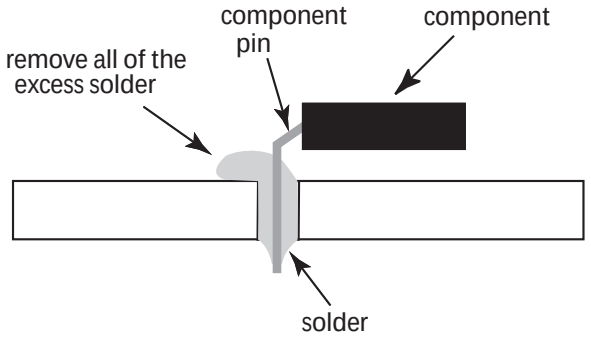
Note: Lead is listed as (Pb) in the periodic table of elements.
In the information below, Pb will refer to Lead solder, and PbF will refer to Lead Free Solder.
The Lead Free Solder used in our manufacturing process and discussed below is Sn(Tin)+Ag(Silver)

This model uses Pb Free solder in it's manufacture due to environmental conservation issues.

PCBs manufactured using lead free solder will have the PbF within a leaf Symbol PbF stamped on the front of PCB.

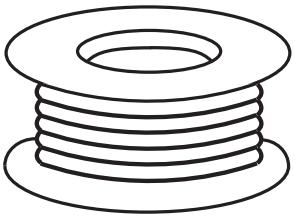
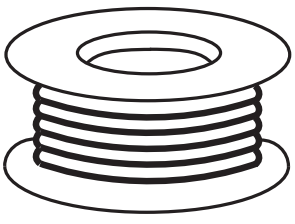
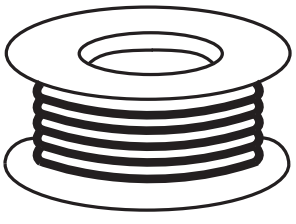
Caution

- Pb free solder has a higher melting point than standard solder. Typically the melting point is 30 ~ 40 °C higher. Please use a high temperature soldering iron and set it to 350 ± 5°C.
- Pb free solder will tend to splash when heated too high (about 1100 °F or 600 °C). If you must use Pb solder, please completely remove all of the Pb free solder on the pins or solder area before applying Pb solder. If this is not practical, be sure to heat the Pb free solder until it melts, before applying Pb solder.
- After applying PbF solder to double layered boards, please check the component side for excess solder which may flow onto the opposite side. (see figure below)



slice view

Suggested Pb free solder

0.3mm X 100g	0.6mm X 100g	1.0mm X 100g
		

GENERAL SPECIFICATIONS

G-1	**TV System**	CRT	CRT Size / Visual Size	13 inch / 335.4mm
			CRT Type	Normal
			Deflection	90 degree
			Magnetic Field BV/BH	+0.45G/0.18G
		Color System		NTSC
		Speaker		1Speaker
			Position	Front
			Size	1.5 x 2.5 Inch
			Impedance	8 ohm
		Sound Output	MAX	1.0 W
			10%(Typical)	0.8 W
		NTSC3.58+4.43 /PAL60Hz		No
G-2	**Tuning System**	Broadcasting System		US System M
		Tuner and Receive CH	System	1Tuner
			Destination	USA(W/ CATV)
			Tuning System	F-Synth
			Input Impedance	VHF/UHF 75 ohm
			CH Coverage	2 - 69, 4A, A-5 - A-1, A - I, J - W, W+1 - W+84
		Intermediate Frequency	Picture(FP)	45.75MHz
			Sound(FS)	41.25MHz
			FP-FS	4.50MHz
		Preset CH		No
		Stereo/Dual TV Sound		No
		Tuner Sound Muting		Yes
G-3	**Power**	Power Source	AC	120V AC 60Hz
			DC	-
		Power Consumption	at AC	
				54 W at AC 120 V 60 Hz
			Stand by (at AC)	3 W at AC 120 V 60 Hz
			Per Year	-- kWh/Year
		Protector	Power Fuse	Yes
G-4	**Regulation**		Safety	UL
			Radiation	FCC
			X-Radiation	DHHS
G-5	**Temperature**		Operation	0oC ~ +40oC
			Storage	-20oC ~ +60oC
G-6	**Operating Humidity**			Less than 80% RH

GENERAL SPECIFICATIONS

G-7	**On Screen Display**	Menu			Yes
			Menu Type		Picture(Matsusita Type)
			Picture		Yes
				Contrast(Picture)	Yes
				Brightness	Yes
				Color	Yes
				Tint	Yes
				Sharpness	Yes
				Normal	Yes
			Audio		No
				Bass	No
				Treble	No
				Balance	No
				BBE On/Off	No
				Stable Sound On/Off	No
			SET UP		Yes
				Language	Yes
				Mode	Yes
				Auto Program	Yes
				Manual Program	Yes
				CC	Yes
			Timer		Yes
			Lock		Yes
			Exit		Yes
				CH Label	No
				Favorite CH	No
				Color Stream DVD/DTV	No
			Control Level		Yes
				Sound	Yes
				Brightness	Yes
				Contrast(Picture)	Yes
				Color	Yes
				Tint	Yes
				Sharpness	Yes
				Tuning	No
				Bass	No
				Treble	No
				Balance	No
				Back Light	No
			Stereo,Audio Output,SAP		No
			Video(Aux)		Yes
			Color Stream		No
			Channel(TV/Cable)		Yes
			CH Label		No
			Sound Mute		Yes
			V-chip Rating		Yes
G-8	**OSD Language**				English French Spanish
G-9	**Clock and Timer**	Sleep Timer		Max Time	120 Min
				Step	10 Min
		On/Off Timer		Program(On Tim / Off Tim)	No
		Wake Up Timer			No
		Timer Back-up (at Power Off Mode)		more than	-- Min Sec

GENERAL SPECIFICATIONS

G-10	Remote Control	Unit		RC-GP
		Glow in Dark Remocon		No
		Format		KASEIKYO
		Custom Code		08-00 h
		Power Source	Voltage(D.C)	3V
			UM size x pcs	UM-3(AA) x 2 pcs
		Total Keys		20 Keys
		Keys	Power	Yes
			1	Yes
			2	Yes
			3	Yes
			4	Yes
			5	Yes
			6	Yes
			7	Yes
			8	Yes
			9	Yes
			0	Yes
			100	No
			CH Up(UP)	Yes
			CH Down(DOWN)	Yes
			Volume Up(Right)	Yes
			Volume Down(Left)	Yes
			TV/Caption/Text	No
			CH1/CH2	No
			TV/Video(TV/AV)	Yes
			CH RTN/CH ENT(Quick View)	Yes
			Sleep	No
			RE Call(Call)	Yes
			Reset	No
			Menu	No
			Enter	No
			Mute	Yes
			Action	Yes
			Exit	No
			MTS(Audio Select)	No
			Set +	No
			Set -	No
G-11	Features	Auto Degauss		Yes
		Auto Shut Off		Yes
		CATV		Yes
		Anti-theft		No
		Rental		No
		Memory(Last CH)		Yes
		Memory(Last Volume)		Yes
		V-Chip		Yes
			Type	USA,ORION Type
		BBE		No
		Auto Search		No
		CH Allocation		No
		SAP		No
		Just Clock Function		No
		CH Label		No
		VM Circuit		No
		Full OSD		No
		Premiere		No
		Comb Filter		No
				Lines
		Auto CH Memory		Yes
		Hotel Lock		No
		Closed Caption		Yes
		Stable Sound		No
		FBT Leak Test Protect		Yes
		CH Lock		No
		Video Lock		No
		Game Timer		No
		Power On Memory		Yes
		Energy Star		Yes(Buyer's Responsibility)
		Favorite CH		No

GENERAL SPECIFICATIONS

G-12	**Accessories**	Owner's Manual		Language	English/Spanish
				W/ Warranty	Yes
		Remote Control Unit			Yes
		Rod Antenna			Yes
				Poles	1Poles
				Terminal	
		Loop Antenna			No
				Terminal	-
		U/V Mixer			No
		DC Car Cord (Center+)			No
		Warranty Card			No
		Warning Sheet			No
		Circuit Diagram			No
		Antenna Change Plug			No
		Service Facility List			No
		Important Safety Instruction			No
		Dew/AHC Caution Sheet			No
		AC Plug Adapter			No
		Quick Set-up Sheet			No
		Battery			Yes
				UM size x pcs	UM3(AA) x 2
				OEM Brand	Yes
		AC Cord			No
		AV Cord (2Pin-1Pin)			No
		Registration Card (NDL Card)			No
		ESP Card			No
		PTB Sheet			No
		300 ohm to 75 ohm Antenna Adapter			No
G-13	**Interface**	Switch	Front	Power	Yes
				System Select	No
				Main Power SW	No
				Sub Power	No
				CH Up(UP)	Yes
				CH Down(DOWN)	Yes
				Volume Up(Right)	Yes
				Volume Down(Left)	Yes
				ACTION=Volume Up+Volume Down	Yes
			Rear	AC/DC	No
				TV/CATV Selector	No
				Degauss	No
				Main Power SW	No
		Indicator		Power	No
				Stand-by	No
				On Timer	No
		Terminals	Front	Video Input	RCA
				Audio Input	RCA x 1
				Other Terminal	Ear Phone
			Rear	Video Input(Rear1)	No
				Video Input(Rear2)	No
				Audio Input(Rear1)	No
				Audio Input(Rear2)	No
				Video Output	No
				Audio Output	No
				Euro Scart	No
				Color Stream	No
				Diversity	No
				Ext Speaker	No
				DC Jack 12V(Center +)	No
				VHF/UHF Antenna Input	F Type
				AC Outlet	No
G-14	**Set Size**			Approx. W x D x H (mm)	359.4 x 354 x 337
G-15	**Weight**			Net (Approx.)	9.5 kg (20.9 lbs)
				Gross (Approx.)	11.0kg (24.4lbs)
G-16	**Carton**		Master Carton		No
				Content	---- Sets
				Material	-- /--
				Dimensions W x D x H(mm)	-- x -- x --
				Description of Origin	No
			Gift Box		Yes
				Material	Double/White
				Dimensions W x D x H(mm)	440 x 408 x 396
				Design	As per Buyer's
				Description of Origin	Yes
			Drop Test		Natural Dropping At 1 Corner / 3 Edges / 6 Surfaces
				Height (cm)	62
			Container Stuffing		725 Sets/40' container

GENERAL SPECIFICATIONS

G-17	**Material**	Cabinet	Cabinet Front	PS 94V0 DECABROM
			Cabinet Rear	PS 94V0 DECABROM
		PCB	Non-Halogen Demand	No
			Eyelet Demand	Yes
G-18	**Environment**	Pb Free	Lead-free Solder	Yes
		Cd Free		No

DISASSEMBLY INSTRUCTIONS

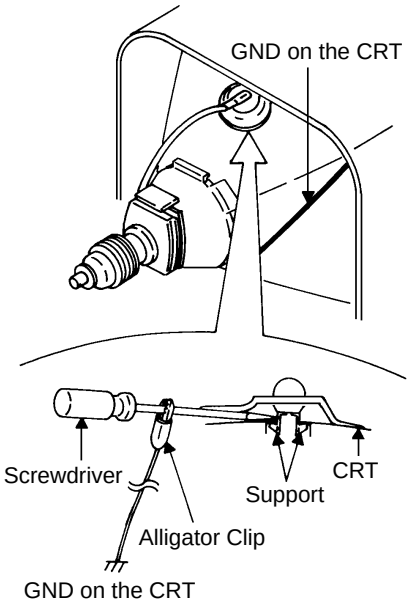
1. REMOVAL OF ANODE CAP

Read the following **NOTED** items before starting work.

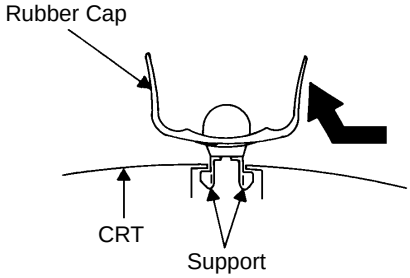
* After turning the power off there might still be a potential voltage that is very dangerous. When removing the Anode Cap, make sure to discharge the Anode Cap's potential voltage.
* Do not use pliers to loosen or tighten the Anode Cap terminal, this may cause the spring to be damaged.

REMOVAL

1. Follow the steps as follows to discharge the Anode Cap.
   Connect one end of an Alligator Clip to the metal part of a flat-blade screwdriver and the other end to ground.
   While holding the plastic part of the insulated Screwdriver, touch the support of the Anode with the tip of the Screwdriver.
   A cracking noise will be heard as the voltage is discharged.



2. Flip up the sides of the Rubber Cap in the direction of the arrow and remove one side of the support.



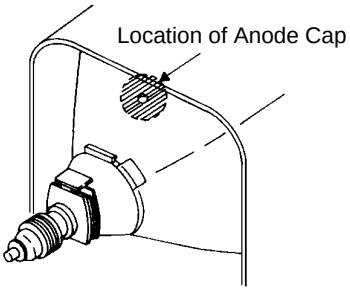
3. After one side is removed, pull in the opposite direction to remove the other.

NOTE

Take care not to damage the Rubber Cap.

INSTALLATION

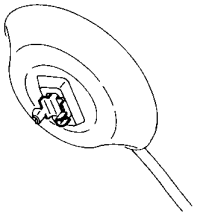
1. Clean the spot where the cap was located with a small amount of alcohol.



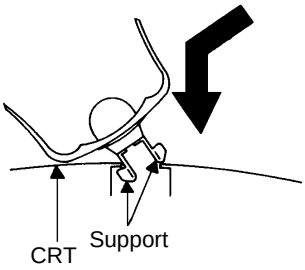
NOTE

Confirm that there is no dirt, dust, etc. at the spot where the cap was located.

2. Arrange the wire of the Anode Cap and make sure the wire is not twisted.
3. Turn over the Rubber Cap.



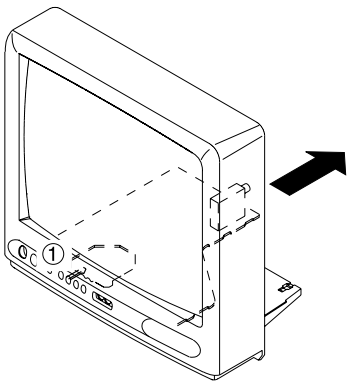
4. Insert one end of the Anode Support into the anode button, then the other as shown in the figure below.



5. Confirm that the Support is securely connected.
6. Put on the Rubber Cap without moving any parts.

2. NOTE FOR THE REMOVAL OF THE MAIN PCB

When the removal of the Main PCB, remove the hook ① first, then draw it in the direction of the arrow.



SERVICE MODE LIST

This unit provided with the following SERVICE MODES so you can repair, examine and adjust easily.
To enter the Service Mode, press both set key and remote control key for more than 1 second.

Set Key	Remocon Key	Operations
VOL. (-) MIN	0	Releasing of V-CHIP PASSWORD.
VOL. (-) MIN	1	User Reset. NOTE: If you set a factory initialization, the memories are reset such as the channel setting, and the POWER ON total hours.
VOL. (-) MIN	3	Remocon code selection. NOTE: If you perform the remocon code selection, the remocon cannot be used. So, do not select the remocon code for the normal servicing.
VOL. (-) MIN	6	POWER ON total hours is displayed on the screen. Refer to the "CONFIRMATION OF HOURS USED". Can be checked of the INITIAL DATA of MEMORY IC. Refer to the "WHEN REPLACING EEPROM (MEMORY) IC".
VOL. (-) MIN	9	Display of the Adjustment MENU on the screen. Refer to the "ELECTRICAL ADJUSTMENT" (On-Screen Display Adjustment).

CONFIRMATION OF HOURS USED

POWER ON total hours can be checked on the screen. Total hours are displayed in 16 system of notation.

NOTE: If you set a factory initialization, the total hours is reset to "0".

1. Set the VOLUME to minimum.
2. Press both VOL. DOWN button on the set and Channel button **(6)** on the remote control for more than 1 second.
3. After the confirmation of using hours, turn off the power.

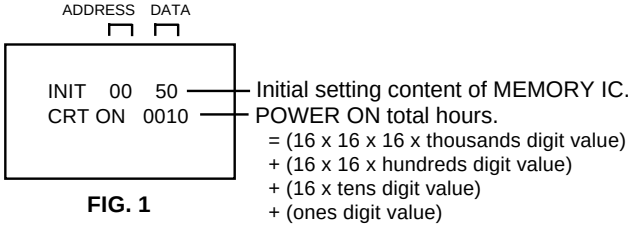

ADDRESS
DATA
INIT 00 50
CRT ON 0010
Initial setting content of MEMORY IC.
POWER ON total hours.
= (16 x 16 x 16 x thousands digit value)
+ (16 x 16 x hundreds digit value)
+ (16 x tens digit value)
+ (ones digit value)

FIG. 1

WHEN REPLACING EEPROM (MEMORY) IC

If a service repair is undertaken where it has been required to change the MEMORY IC, the following steps should be taken to ensure correct data settings while making reference to TABLE 1.

NOTE: No need setting for after INI 0F due to the adjustment value.

INI	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+A	+B	+C	+D	+E	+F
00	50	04	FB	4C	46	B3	24	69	39	30	00	05	90	D4	00	07

Table 1

1. Enter DATA SET mode by setting VOLUME to minimum.
2. Press both VOL. DOWN button on the set and Channel button **(6)** on the remote control for more than 1 second. ADDRESS and DATA should appear as FIG 1.
3. ADDRESS is now selected and should "blink". Using the CH. UP/DOWN button on the remote, step through the ADDRESS until required ADDRESS to be changed is reached.
4. Press VOL. UP/DOWN button to select DATA. When DATA is selected, it will "blink".
5. Again, step through the DATA using VOL. UP/DOWN button until required DATA value has been selected.
6. Pressing CH. UP/DOWN button will take you back to ADDRESS for further selection if necessary.
7. Repeat steps 3 to 6 until all data has been checked.
8. When satisfied correct DATA has been entered, turn POWER off (return to STANDBY MODE) to finish DATA input. **After the data input, do the User Reset.**
9. Turn POWER on.
10. Press both VOL. DOWN button on the set and Channel button **(1)** on the remote control for more than 1 second.
11. After the finishing of the initializing of shipping, the unit will turn off automatically.

The unit will now have the correct DATA for the new MEMORY IC.

Service mode default values		
NO.	FUNCTION	STEP NO.
00	OSD H	19
01	CUT OFF	---
04	H.VCO	4
05	H.PHASE	11
06	V.SIZE	35
07	V.SHIFT	1
08	R.DRIVE	10
09	B.DRIVE	10
10	R.BIAS	64
11	G.BIAS	64
12	B.BIAS	64
13	BRIGHT CENT	120
14	BRIGHT MAX	140
15	BRIGHT MIN	60
16	CONTRAST CENT	30
17	CONTRAST MAX	45
18	CONTRAST MIN	17
19	COLOR CENT	50
20	COLOR MAX	74
21	COLOR MIN	0
22	TINT	47
23	SHARPNESS	40
28	TEST MONO	0

ELECTRICAL ADJUSTMENTS

1. BEFORE MAKING ELECTRICAL ADJUSTMENTS

Read and perform these adjustments when repairing the circuits or replacing electrical parts or PCB assemblies.

CAUTION

- Use an isolation transformer when performing any service on this chassis.
- Before removing the anode cap, discharge electricity because it contains high voltage.
- When removing a PCB or related component, after unfastening or changing a wire, be sure to put the wire back in its original position.
- When you exchange IC and Transistor for a heat sink, apply the silicon grease **(YG6260M)** on the contact section of the heat sink. Before applying new silicon grease, remove all the old silicon grease. (Old grease may cause damages to the IC and Transistor.)
- **The adjustments are needed for each mode, RF mode and AV mode. Perform the adjustments refering each adjustment items.**

Prepare the following measurement tools for electrical adjustments.

1. Oscilloscope
2. Digital Voltmeter
3. Pattern Generator

On-Screen Display Adjustment

1. In the condition of NO indication on the screen. Press the VOL. DOWN button on the set and the Channel button **(9)** on the remote control for more than 1 second to appear the adjustment mode on the screen as shown in **Fig. 1-1**.

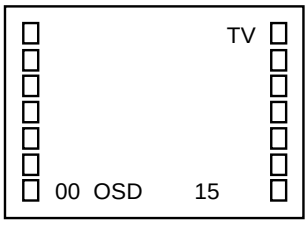


Fig. 1-1

2. Use the Channel UP/DOWN button or Channel button **(0-9)** on the remote control to select the options shown in **Fig. 1-2**.
3. Press the ACTION button on the remote control to end the adjustments.

NO.	FUNCTION	NO.	FUNCTION
00	OSD H	14	BRIGHT MAX
01	CUT OFF	15	BRIGHT MIN
04	H.VCO	16	CONTRAST CENT
05	H.PHASE	17	CONTRAST MAX
06	V.SIZE	18	CONTRAST MIN
07	V.SHIFT	19	COLOR CENT
08	R.DRIVE	20	COLOR MAX
09	B.DRIVE	21	COLOR MIN
10	R.BIAS	22	TINT
11	G.BIAS	23	SHARPNESS
12	B.BIAS	28	TEST MONO
13	BRIGHT CENT		

Fig. 1-2

2. BASIC ADJUSTMENTS

2-1: CUT OFF (RF)

1. Adjust the unit to the following settings. R.DRIVE=10, B.DRIVE=10, R.BIAS=64, G.BIAS=64, B.BIAS=64, BRIGHTNESS=120, CONTRAST=40.
2. Place the set with Aging Test for more than 15 minutes.
3. Activate the adjustment mode display of **Fig. 1-1** and press the channel button **(01)** on the remote control to select "CUT OFF".
4. Adjust the **Screen Volume** until a dim raster is obtained.

2-2: WHITE BALANCE (RF)

NOTE: Adjust after performing CUT OFF adjustment.

1. Place the set with Aging Test for more than 10 minutes.
2. Receive the gray scale pattern from the Pattern Generator.
3. Using the remote control, set the brightness and contrast to normal position.
4. Activate the adjustment mode display of **Fig. 1-1** and press the channel button **(10)** on the remote control to select “R. BIAS”.
5. Press the CH. UP/DOWN button on the remote control to select the “R. BIAS”, “G. BIAS”, “B. BIAS”, “R. DRIVE” or “B. DRIVE”.
6. Adjust the VOL. UP/DOWN button on the remote control to whiten the R. BIAS, G. BIAS, B. BIAS, R. DRIVE, and B. DRIVE at each step tone sections equally.
7. Perform the above adjustments 5 and 6 until the white color is looked like a white.

2-3: FOCUS (RF)

1. Receive a broadcast.
2. Turn the Focus Volume fully counterclockwise once.
3. Adjust the **Focus Volume** until picture is distinct.

2-4: HORIZONTAL PHASE (RF)

1. Receive the center cross signal from the Pattern Generator.
2. Activate the adjustment mode display of **Fig. 1-1** and press the channel button **(05)** on the remote control to select "H.PHAS".
3. Press the VOL. UP/DOWN button on the remote control until the right and left screen size of the vertical line becomes the same.

2-5: VERTICAL SIZE (RF)

1. Receive the cross hatch signal from the Pattern Generator.
2. Using the adjustment control, set the brightness and contrast to normal position.
3. Activate the adjustment mode display of **Fig. 1-1** and press the channel button **(06)** on the remote control to select "V.SIZE".
4. Press the VOL. UP/DOWN button on the remote control until the rectangle on the center of the screen becomes square.
5. Receive a broadcast and check if the picture is normal.

ELECTRICAL ADJUSTMENTS

2-6: VERTICAL SHIFT (RF)

1. Receive the center cross signal from the Pattern Generator.
2. Activate the adjustment mode display of **Fig. 1-1** and press the channel button **(07)** on the remote control to select "V.SFT".
3. Press the VOL. UP/DOWN button on the remote control until the horizontal line becomes fit to the notch of the shadow mask.

2-7: OSD HORIZONTAL (RF)

1. Activate the adjustment mode display of **Fig. 1-1**.
2. Press the VOL. UP/DOWN button on the remote control until the difference of A and B becomes minimum. **(Refer to Fig. 2-1)**

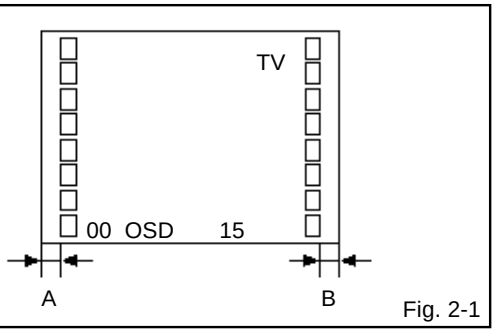


Fig. 2-1

2-8: BRIGHTNESS MANUAL (RF, AV)

1. Activate the adjustment mode display of **Fig. 1-1** and press the channel button **(13)** on the remote control to select "BRI.CENT".
2. Press the VOL. UP/DOWN button on the remote control until the brightness step No. becomes "120".
3. Receive a broadcast and check if the picture is normal.
4. Press the TV/VIDEO button on the remote to set to the AV mode. Then perform the above adjustment 2~3.

2-9: SUB TINT/SUB COLOR (RF, AV)

1. Receive the color bar pattern. (RF Input)
2. Activate the adjustment mode display of **Fig. 1-1** and press the channel button **(22)** on the remote control to select "TINT".
3. Connect the oscilloscope to **TP023**.
4. Press the VOL. UP/DOWN button on the remote control until the section "A" becomes as straight line. **(Refer to Fig. 2-2)**
5. Press the channel button **(19)** on the remote control to select "COL. CENT".
6. Connect the oscilloscope to **TP022**.
7. Adjust the VOLTS RANGE VARIABLE knob of the oscilloscope until the range between white 100% and 0% is set to 5 scales on the screen of the oscilloscope.
8. Press the VOL. UP/DOWN button on the remote control until the red color level is adjusted to 110% of the white level. **(Refer to Fig. 2-3)**
9. Receive the color bar pattern. (Audio Video Input)
10. Press the TV/VIDEO button on the remote control to set to the AV mode. Then perform the above adjustments 2~8.

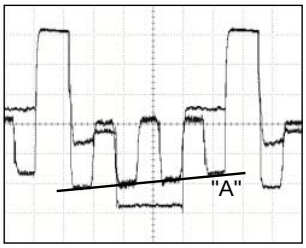


Fig. 2-2

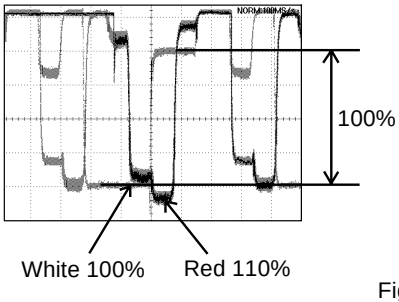


Fig. 2-3

2-10: SUB CONTRAST (RF, AV)

1. Activate the adjustment mode display of **Fig. 1-1** and press the channel button **(17)** on the remote control to select "CONT.MAX".
2. Press the VOL. UP/DOWN button on the remote control until the contrast step No. becomes "45".
3. Receive a broadcast and check if the picture is normal.
4. Press the TV/VIDEO button on the remote to set to the AV mode. Then perform the above adjustment 2~3.

ELECTRICAL ADJUSTMENTS

3. PURITY AND CONVERGENCE ADJUSTMENTS

NOTE

1. Turn the unit on and let it warm up for at least 30 minutes before performing the following adjustments.
2. Place the CRT surface facing east or west to reduce the terrestrial magnetism.
3. Turn ON the unit and demagnetize with a Degauss Coil.

3-1: STATIC CONVERGENCE (ROUGH ADJUSTMENT)

1. Tighten the screw for the magnet. Refer to the adjusted CRT for the position. **(Refer to Fig. 3-1)**
   If the deflection yoke and magnet are in one body, untighten the screw for the body.
2. Receive the green raster pattern from the color bar generator.
3. Slide the deflection yoke until it touches the funnel side of the CRT.
4. Adjust center of screen to green, with red and blue on the sides, using the pair of purity magnets.
5. Switch the color bar generator from the green raster pattern to the crosshatch pattern.
6. Combine red and blue of the 3 color crosshatch pattern on the center of the screen by adjusting the pair of 4 pole magnets.
7. Combine red/blue (magenta) and green by adjusting the pair of 6 pole magnets.
8. Adjust the crosshatch pattern to change to white by repeating steps 6 and 7.

3-2: PURITY

NOTE

Adjust after performing adjustments in section 3-1.

1. Receive the green raster pattern from color bar generator.
2. Adjust the pair of purity magnets to center the color on the screen.
   Adjust the pair of purity magnets so the color at the ends are equally wide.
3. Move the deflection yoke backward (to neck side) slowly, and stop it at the position when the whole screen is green.
4. Confirm red and blue color.
5. Adjust the slant of the deflection yoke while watching the screen, then tighten the fixing screw.

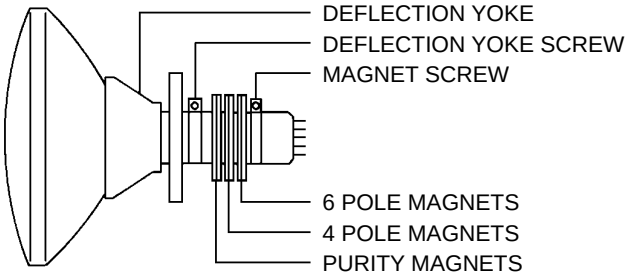


Fig. 3-1

3-3: STATIC CONVERGENCE

NOTE

Adjust after performing adjustments in section 3-2.

1. Receive the crosshatch pattern from the color bar generator.
2. Combine red and blue of the 3 color crosshatch pattern on the center of the screen by adjusting the pair of 4 pole magnets.
3. Combine red/blue (magenta) and green by adjusting the pair of 6 pole magnets.

3-4: DYNAMIC CONVERGENCE

NOTE

Adjust after performing adjustments in section 3-3.

1. Adjust the differences around the screen by moving the deflection yoke upward/downward and right/left.
   (Refer to Fig. 3-2-a)
2. Insert three wedges between the deflection yoke and CRT funnel to fix the deflection yoke.
   (Refer to Fig. 3-2-b)

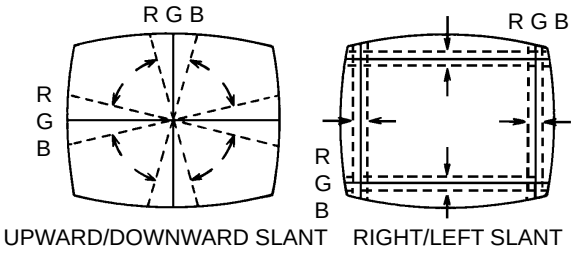


Fig. 3-2-a

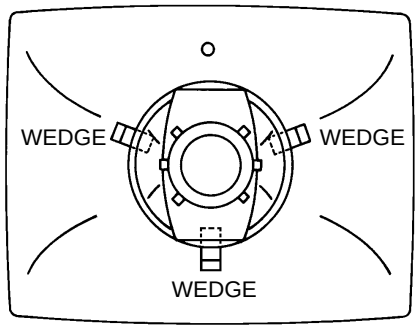
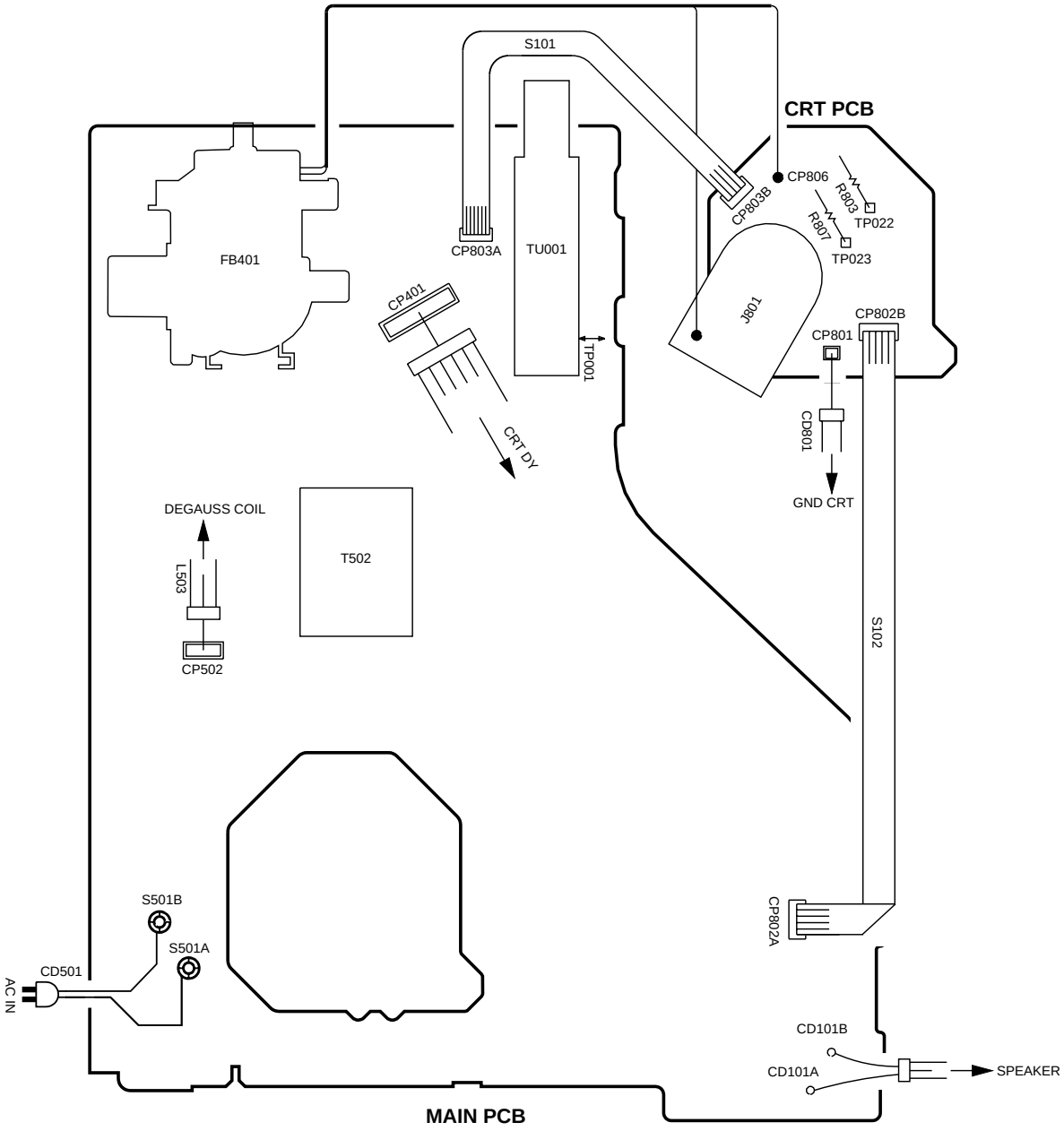


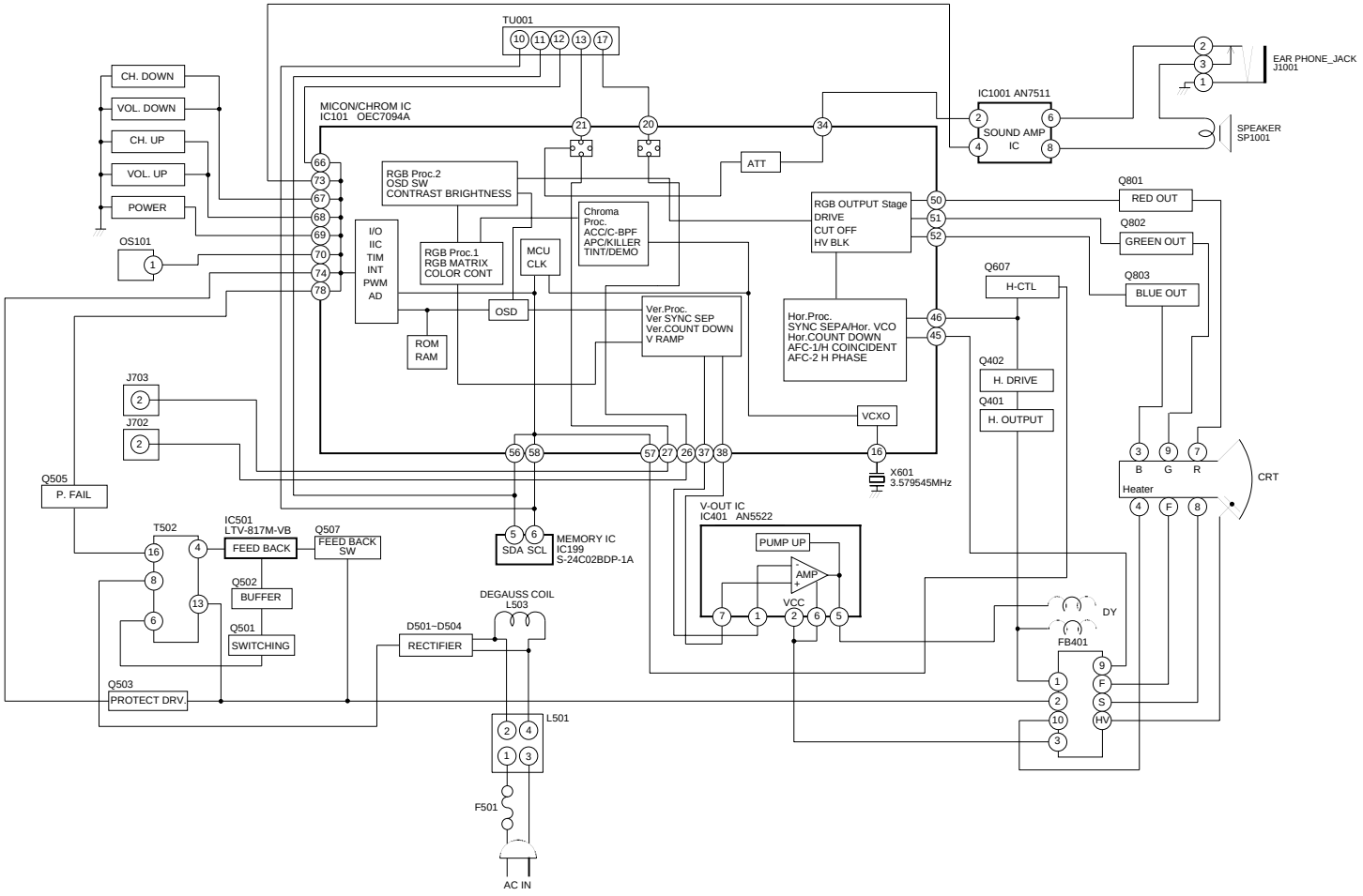
Fig. 3-2-b

ELECTRICAL ADJUSTMENTS

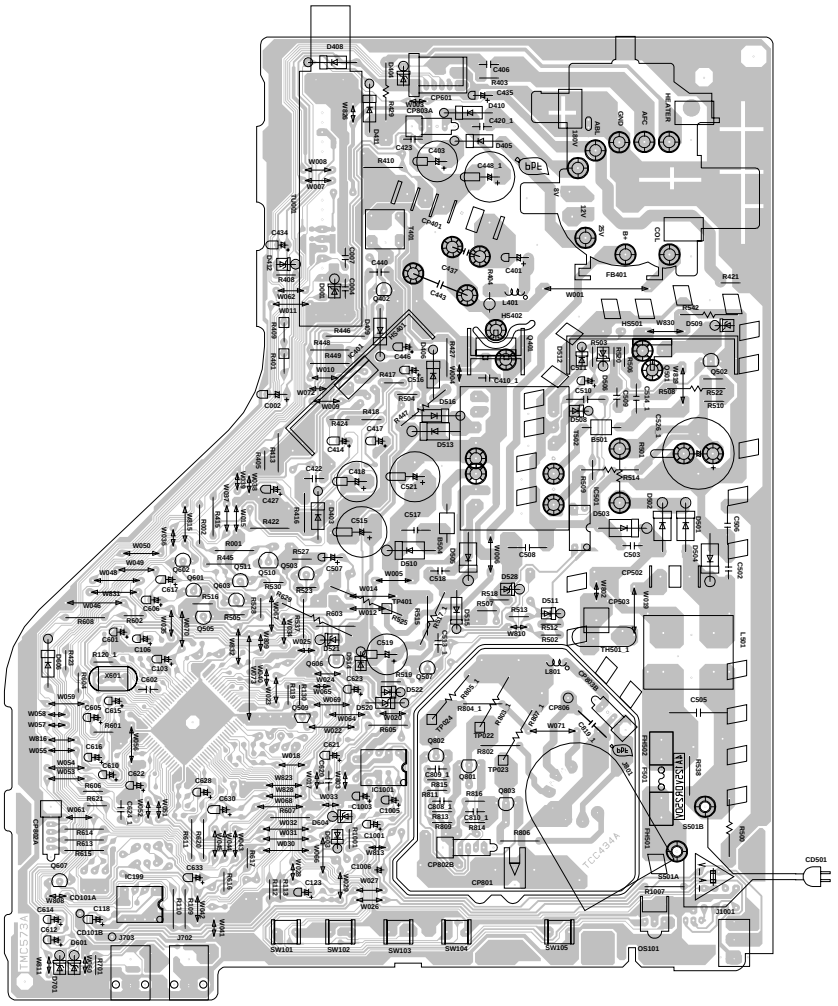
4. ELECTRICAL ADJUSTMENT PARTS LOCATION GUIDE (WIRING CONNECTION)



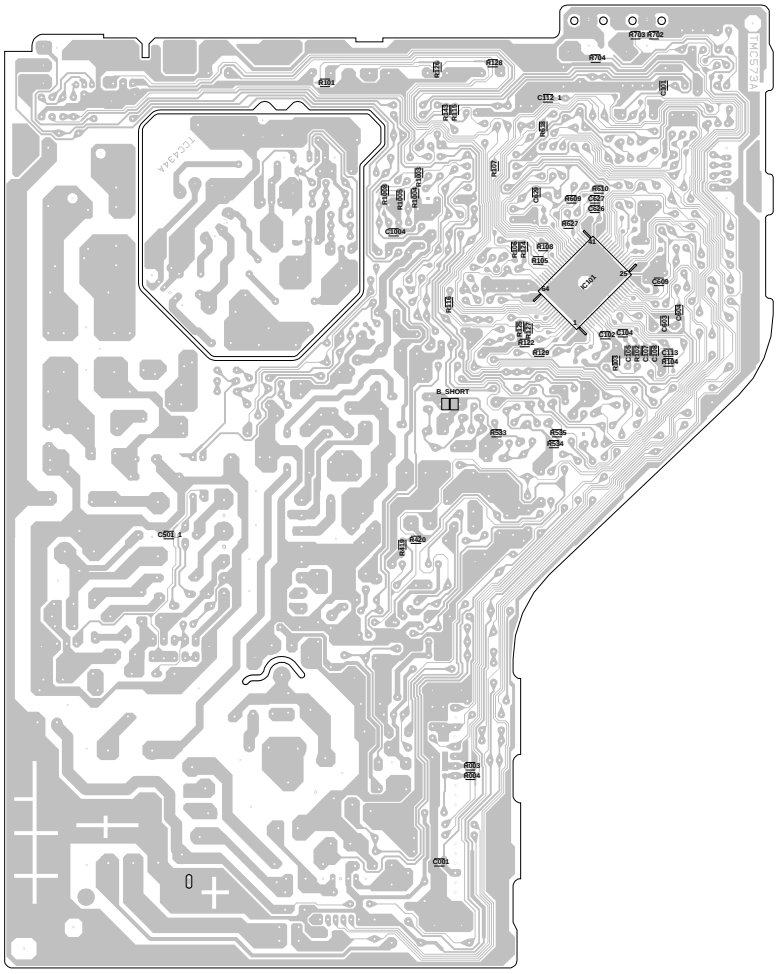
BLOCK DIAGRAM



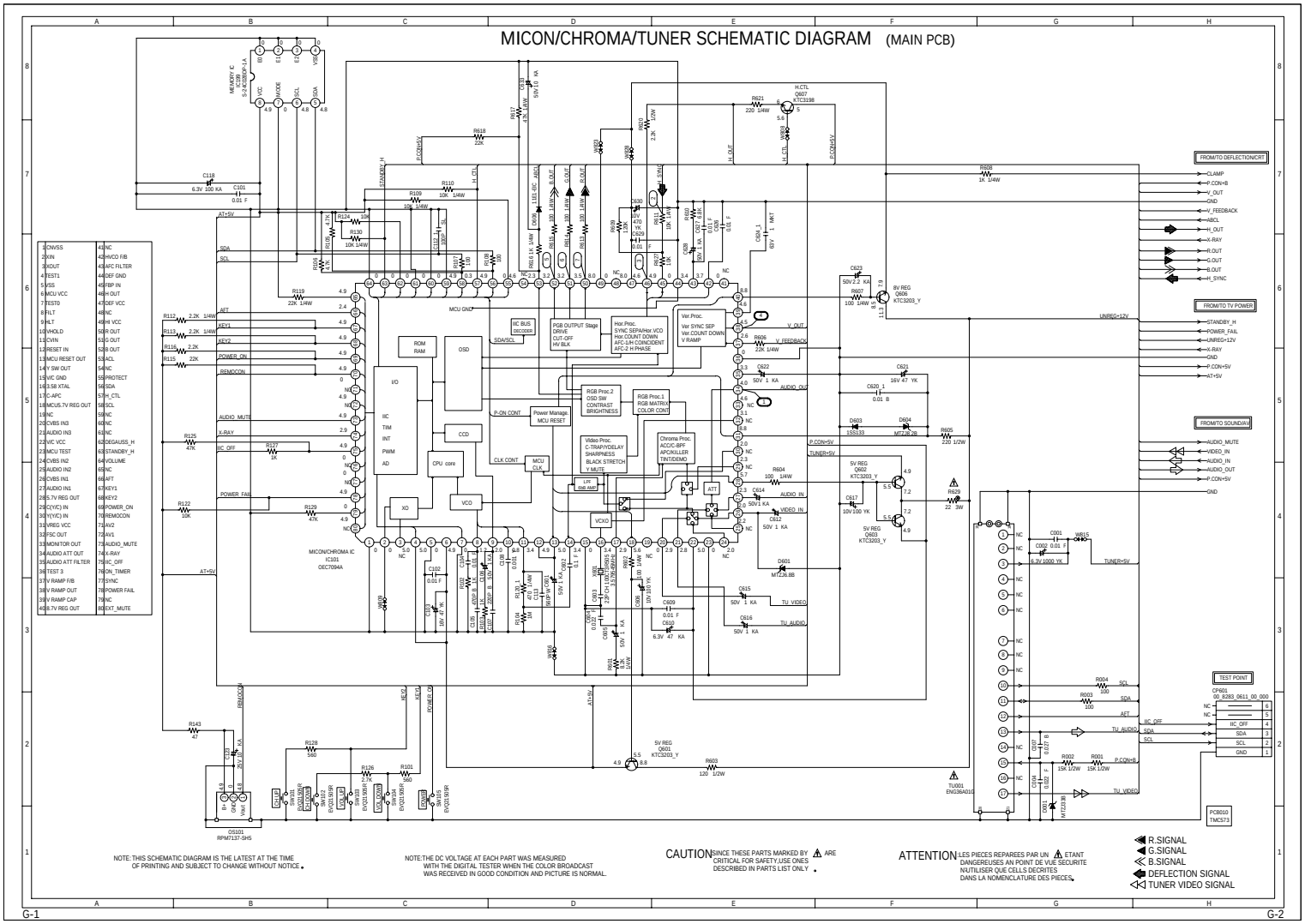
PRINTED CIRCUIT BOARDS
MAIN/CRT (INSERTED PARTS)
SOLDER SIDE



PRINTED CIRCUIT BOARDS
MAIN (CHIP MOUNTED PARTS)
SOLDER SIDE



MICON/CHROMA/TUNER SCHEMATIC DIAGRAM (MAIN PCB)



1 CONVSS	41 NC
2 XIN	42 HVCO F/B
3 XOUT	43 AFC FILTER
4 TEST1	44 DEF GND
5 VSS	45 FBP IN
6 MCU VCC	46 H OUT
7 TEST0	47 DEF VCC
8 RLT	48 NC
9 HLT	49 H VCC
10 VHOLD	50 B OUT
11 CVIN	51 G OUT
12 RESET IN	52 R OUT
13 MCU RESET OUT	53 ACL
14 Y SW OUT	54 NC
15 VIC GND	55 PROTECT
16 3.58 XTAL	56 SDA
17 C-APC	57 H_CTL
18 MCUS.7V REG OUT	58 SCL
19 NC	59 NC
20 CVBS IN3	60 NC
21 AUDIO IN3	61 NC
22 VIC VCC	62 DEGAUSS_H
23 MCU TEST	63 STANDBY_H
24 CVBS IN2	64 VOLUME
25 AUDIO IN2	65 NC
26 CVBS IN1	66 AFT
27 AUDIO IN1	67 KEY1
28 5.7V REG OUT	68 KEY2
29 C(Y/C) IN	69 POWER_ON
30 Y(Y/C) IN	70 REMOCON
31 VREG VCC	71 AV2
32 ISC OUT	72 AV1
33 MONITOR OUT	73 AUDIO_MUTE
34 AUDIO ATT OUT	74 X-RAY
35 AUDIO ATT FILTER	75 IIC_OFF
36 TEST 3	76 ON_TIMER
37 V RAMP F/B	77 SYNC
38 V RAMP OUT	78 POWER FAIL
39 V RAMP CAP	79 NC
40 5.7V REG OUT	80 EXT_MUTE

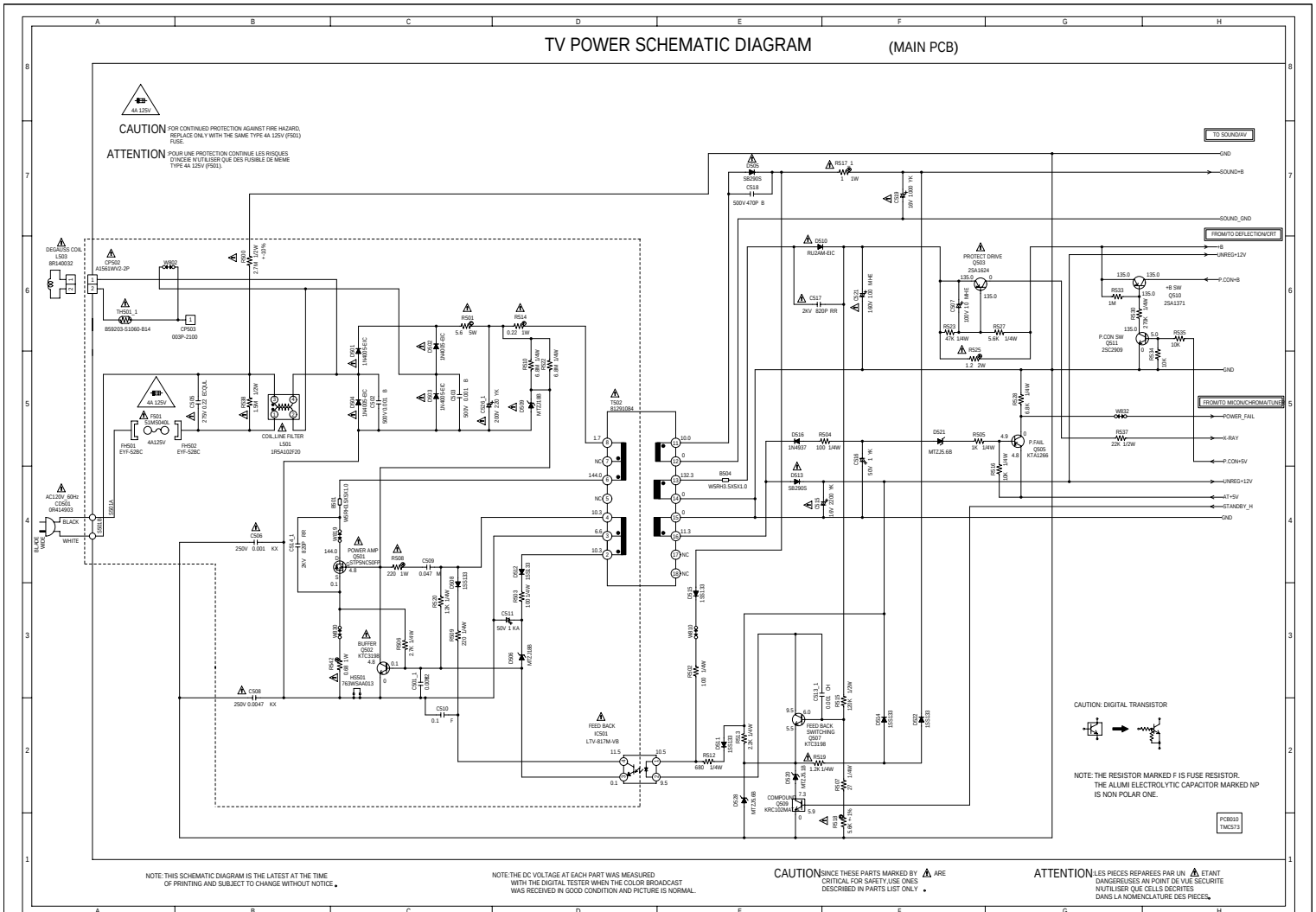
NOTE: THIS SCHEMATIC DIAGRAM IS THE LATEST AT THE TIME OF PRINTING AND SUBJECT TO CHANGE WITHOUT NOTICE.

NOTE: THE DC VOLTAGE AT EACH PART WAS MEASURED WITH THE DIGITAL TESTER WHEN THE COLOR BROADCAST WAS RECEIVED IN GOOD CONDITION AND PICTURE IS NORMAL.

CAUTION: SINCE THESE PARTS MARKED BY ⚠ ARE CRITICAL FOR SAFETY.USE ONES DESCRIBED IN PARTS LIST ONLY.

ATTENTION: LES PIECES REPAREES PAR UN ⚠ ETANT DANGEREUSES AN POINT DE VUE SECURITE NUTILISER QUE CELLS DECRITES DANS LA NOMENCLATURE DES PIECES.

TV POWER SCHEMATIC DIAGRAM (MAIN PCB)

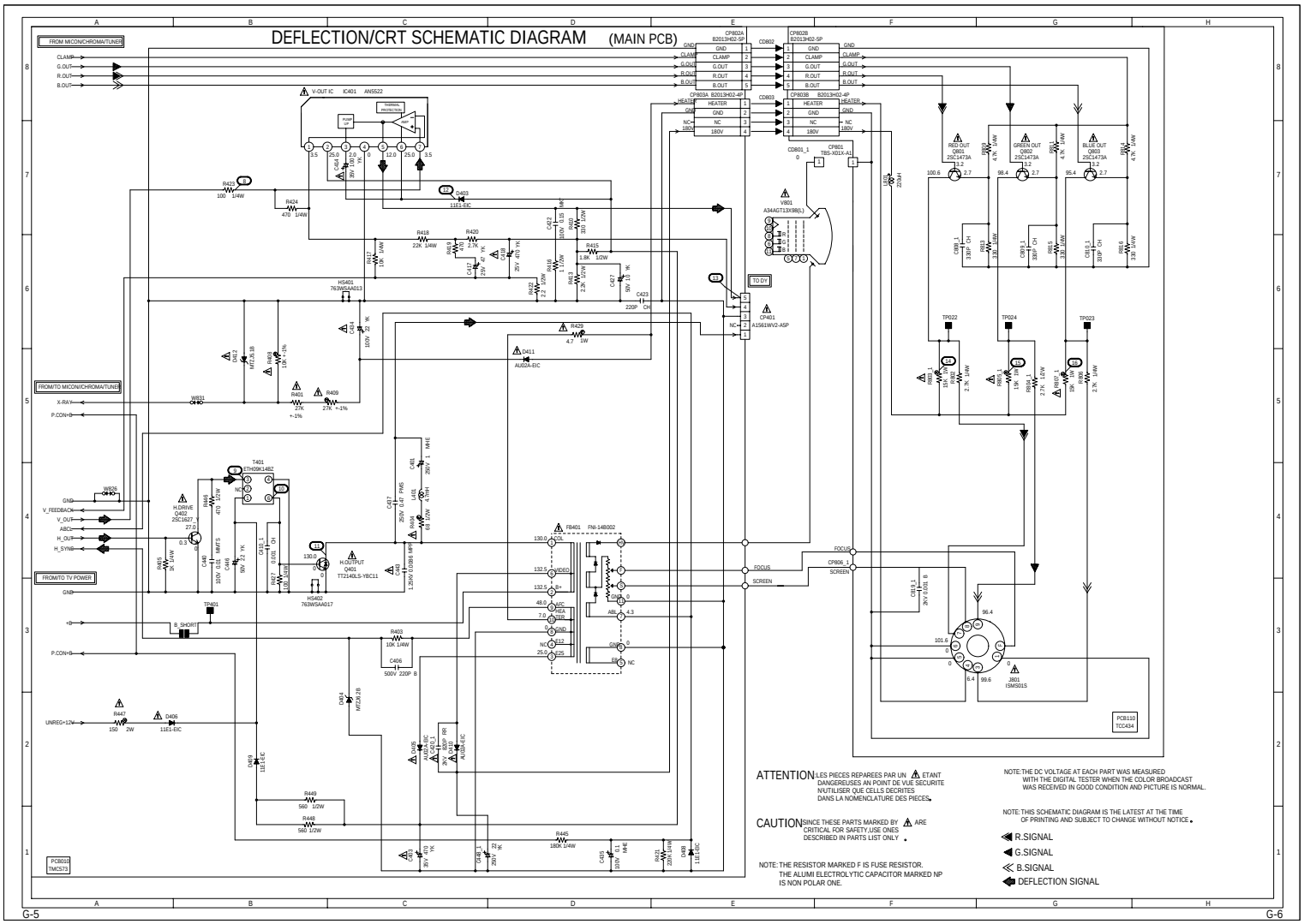


NOTE: THIS SCHEMATIC DIAGRAM IS THE LATEST AT THE TIME OF PRINTING AND SUBJECT TO CHANGE WITHOUT NOTICE.

NOTE:THE DC VOLTAGE AT EACH PART WAS MEASURED WITH THE DIGITAL TESTER WHEN THE COLOR BROADCAST WAS RECEIVED IN GOOD CONDITION AND PICTURE IS NORMAL.

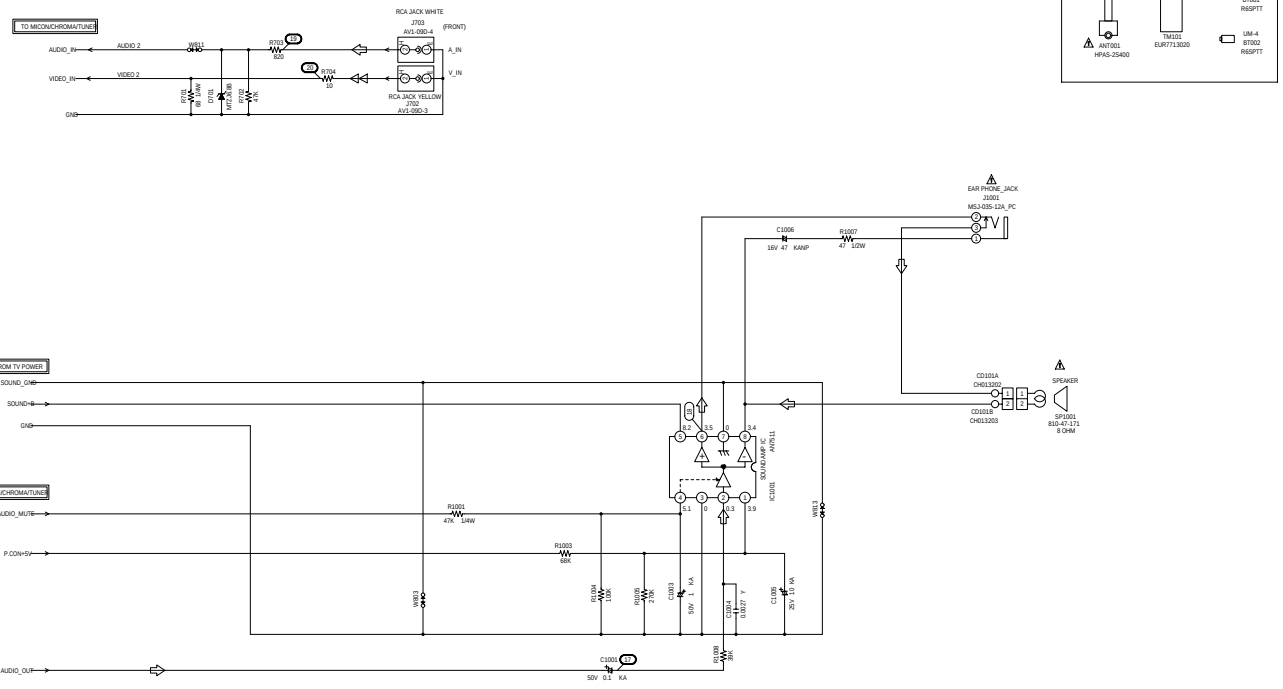
CAUTION SINCE THESE PARTS MARKED BY ⚠ ARE CRITICAL FOR SAFETY.USE ONES DESCRIBED IN PARTS LIST ONLY.

ATTENTION LES PIECES REPAREES PAR UN ⚠ ETANT DANGEREUSES AN POINT DE VUE SECURITE N'UTILISER QUE CELLS DECRITES DANS LA NOMENCLATURE DES PIECES.


DEFLECTION/CRT SCHEMATIC DIAGRAM (MAIN PCB)
FROM MICONCHROMA/TUNER
FROM/TO MICON/CHROMA/TUNER
FROM/TO TV POWER
TO DY
CP802A B2013H02-SP
CP802B B2013H02-SP
CP803A B2013H02-4P
CP803B B2013H02-4P
CP801 TBS-X01X-A1
CP401 A1561WV2-ASP
V-OUT IC IC401 AN5522
H.DRIVE Q402 2SC1627
H.OUTPUT Q401 TT2140LS-YBC11
RED OUT Q801 2SC1473A
GREEN OUT Q802 2SC1473A
BLUE OUT Q803 2SC1473A
FB401 FW-14B002
J801 ISMS01S
PCB102 TMCS73
PCB110 TCC434
ATTENTION
CAUTION
NOTE: THE RESISTOR MARKED F IS FUSE RESISTOR. THE ALUMI.ELECTROLYTIC CAPACITOR MARKED NP IS NON POLAR ONE.
NOTE:THE DC VOLTAGE AT EACH PART WAS MEASURED WITH THE DIGITAL TESTER WHEN THE COLOR BROADCAST WAS RECEIVED IN GOOD CONDITION AND PICTURE IS NORMAL.
NOTE: THIS SCHEMATIC DIAGRAM IS THE LATEST AT THE TIME OF PRINTING AND SUBJECT TO CHANGE WITHOUT NOTICE.
R.SIGNAL
G.SIGNAL
B.SIGNAL
DEFLECTION SIGNAL

SOUND/AV SCHEMATIC DIAGRAM

(MAIN PCB)



NOTE: THE DC VOLTAGE AT EACH PART WAS MEASURED WITH THE DIGITAL TESTER WHEN THE COLOR BROADCAST WAS RECEIVED IN GOOD CONDITION AND PICTURE IS NORMAL.

NOTE: THIS SCHEMATIC DIAGRAM IS THE LATEST AT THE TIME OF PRINTING AND SUBJECT TO CHANGE WITHOUT NOTICE.

CAUTION SINCE THESE PARTS MARKED BY ⚠ ARE CRITICAL FOR SAFETY, USE ONES DESCRIBED IN PARTS LIST ONLY.

ATTENTION LES PIECES REPAREES PAR UN ⚠ ETANT DANGEREUSES AN POINT DE VUE SECURITE N'UTILISER QUE CELLS DECRITES DANS LA NOMENCLATURE DES PIECES.

TUNER VIDEO SIGNAL

AUDIO SIGNAL

PCB010
TMC573

VOLTAGE LIST

IC

IC101			
Pin	Volt.	Pin	Volt.
1	0	33	4.6
2	0	34	4
3	5	35	3.3
4	5	36	0
5	0	37	2.6
6	4.9	38	4.5
7	0	39	4.6
8	1.2	40	8.8
9	2	41	0
10	0.8	42	0
11	3.4	43	3.7
12	4.9	44	3.4
13	5	45	0
14	3.4	46	4.9
15	0	47	4.6
16	3.4	48	8
17	2.9	49	0
18	5.6	50	8
19	0	51	3.5
20	2.9	52	3.2
21	2.8	53	3.2
22	5	54	2.3
23	0	55	4.6
24	2	56	0
25	2.2	57	4.9
26	2	58	0.3
27	2.3	59	4.9
28	5.7	60	0
29	2.3	61	0
30	2	62	0
31	8.8	63	0
32	3.1	64	0

IC199	
Pin	Volt.
1	0
2	0
3	0
4	0
5	4.8
6	4.8
7	0
8	4.9

IC1001	
Pin	Volt.
1	3.9
2	0.3
3	0
4	5.1
5	8.2
6	3.5
7	0
8	3.4

IC401	
Pin	Volt.
1	3.5
2	25
3	2
4	0
5	12
6	25
7	3.5

IC501	
Pin	Volt.
1	10.5
2	9.5
3	0.1
4	11.5

TRANSISTOR

Q401	
Pin	Volt.
B	0
C	130
E	0

Q402	
Pin	Volt.
B	0.3
C	27
E	0

Q501	
Pin	Volt.
G	4.8
S	0.1
D	144

Q502	
Pin	Volt.
B	0.1
C	4.8
E	0

Q503	
Pin	Volt.
B	135
C	0
E	135

Q505	
Pin	Volt.
B	4.9
C	0
E	4.8

Q506	
Pin	Volt.
B	0
C	0
E	0

Q507	
Pin	Volt.
B	6
C	9.5
E	5.5

Q509	
Pin	Volt.
B	5.9
C	7.3
E	0

Q510	
Pin	Volt.
B	135
C	135
E	135

Q511	
Pin	Volt.
B	5
C	135
E	0

Q601	
Pin	Volt.
B	5.5
C	8.8
E	4.9

Q602	
Pin	Volt.
B	5.5
C	7.2
E	4.9

Q603	
Pin	Volt.
B	5.5
C	7.2
E	4.9

Q606	
Pin	Volt.
B	8.5
C	11.3
E	7.9

Q607	
Pin	Volt.
B	5.6
C	5
E	6

Q801	
Pin	Volt.
B	3.2
C	100.6
E	2.7

Q802	
Pin	Volt.
B	3.2
C	98.4
E	2.7

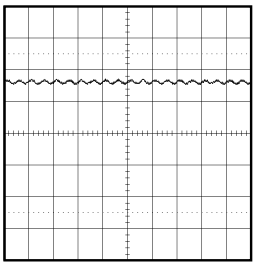
Q803	
Pin	Volt.
B	3.2
C	95.4
E	2.7

B ..... BASE
C ..... COLLECTOR
E ..... EMITTER

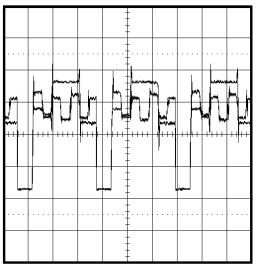
G ..... GATE
S ..... SOURCE
D ..... DRAIN

WAVEFORMS

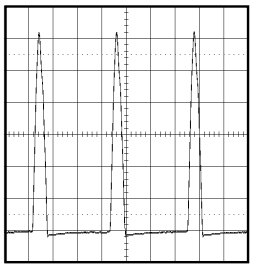
MICON/CHROMA/TUNER



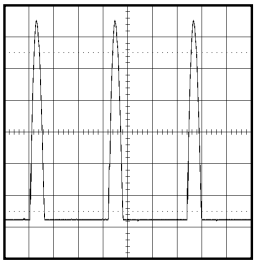
① 0.5V 2ms/div
IC101 PIN 34(AUDIO OUT)



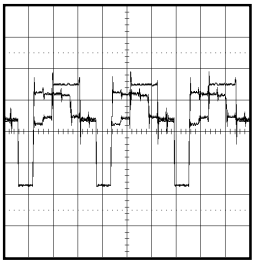
⑥ 1V 20µs/div
IC101 PIN 51(G.OUT)



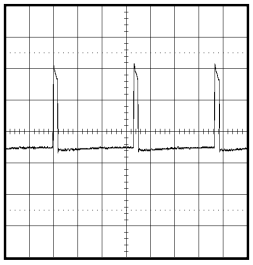
⑪ 200V 20µs/div
Q401 Collector



② 20V 20µs/div
R611

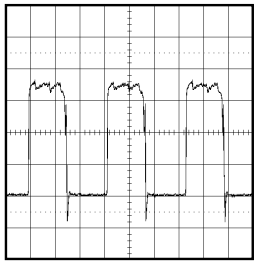


⑦ 1V 20µs/div
IC101 PIN 50(R. OUT)

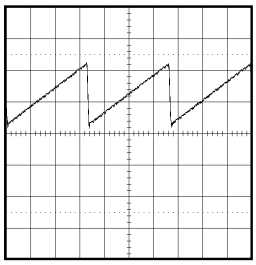


⑫ 10V 5ms/div
D403

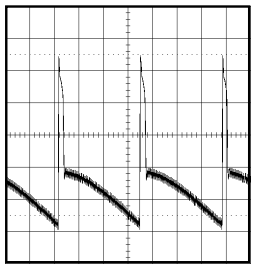
DEFLECTION/CRT



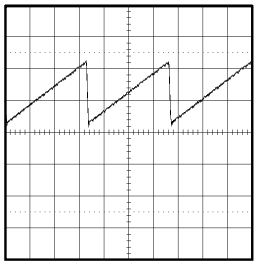
③ 200mV 20µs/div
IC101 PIN 46(H.OUT)



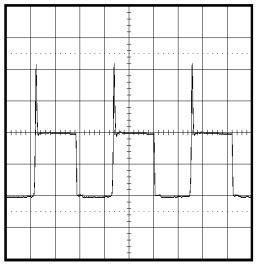
⑧ 0.5V 5ms/div
R423



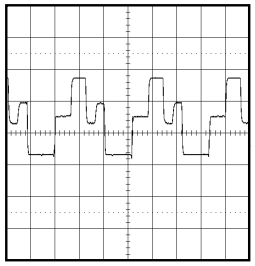
⑬ 10V 5ms/div
CP401 PIN 5



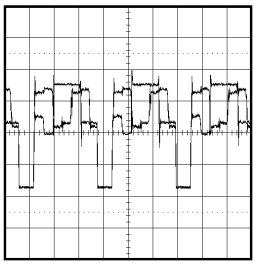
④ 0.5V 5ms/div
IC101 PIN 38(V.OUT)



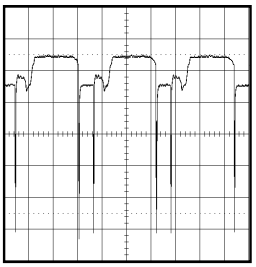
⑨ 20V 20µs/div
T401 PIN 3



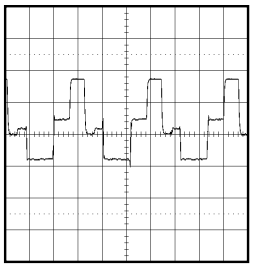
⑭ 50V 20µs/div
R803



⑤ 1V 20µs/div
IC101 PIN 52(B.OUT)



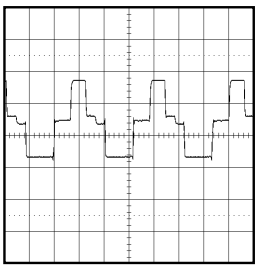
⑩ 2V 20µs/div
T401 PIN 6



⑮ 50V 20µs/div
R805

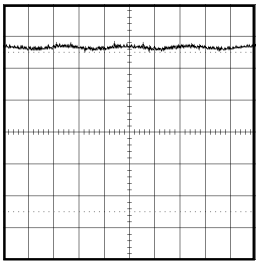
NOTE: The following waveforms were measured at the point of the corresponding balloon number in the schematic diagram.

WAVEFORMS

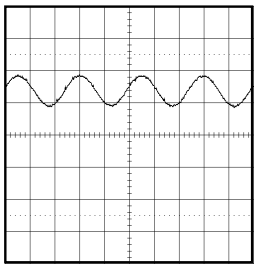


⑯ 50V 20µs/div
R807

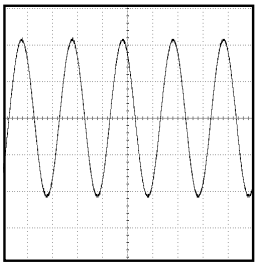
SOUND/AV



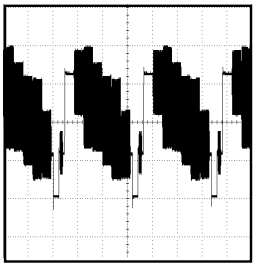
⑰ 0.5V 1ms/div
C1001



⑱ 1V 1ms/div
IC1001 PIN 6



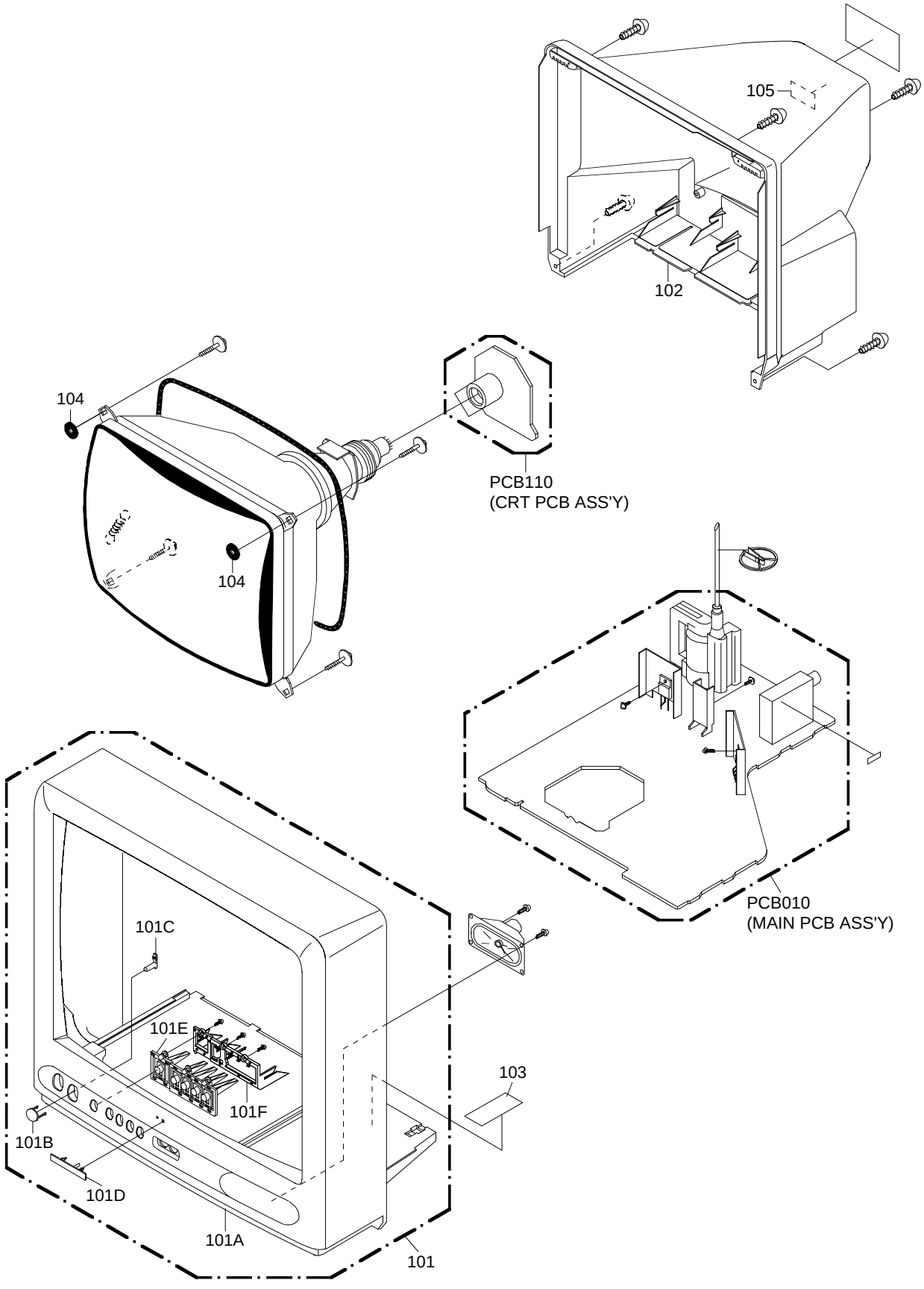
⑲ 200mV 500µs/div
R703



⑳ 500mV 20µs/div
R704

NOTE: The following waveforms were measured at the point of the corresponding balloon number in the schematic diagram.

MECHANICAL EXPLODED VIEW



MECHANICAL REPLACEMENT PARTS LIST

Location No.	Part No.	Description	Reference No.
101	702WPAA371	CABINET,FRONT ASSY (CT-13R18B)	
	702WPAA371	CABINET,FRONT ASSY (CT-13R38S)	
	702WPBA091	CABINET,FRONT ASSY (CT-13R28W)	
101A	701WPJC164	CABINET,FRONT (CT-13R18B)	
	701WPJC193	CABINET,FRONT (CT-13R38S)	
	701WPJC189	CABINET,FRONT (CT-13R28W)	
101B	711WPAA090	PLATE,FRONT	
101C	713WPAA095	GUIDE,REMOCON	
101D	723576A001	BADGE,BRAND (CT-13R18B)	
	723576A002	BADGE,BRAND (CT-13R38S, CT-13R28W)	
101E	735WPAA496	BUTTON,FRAME (CT-13R18B)	
	735WPAA494	BUTTON,FRAME (CT-13R38S)	
	735WPAA497	BUTTON,FRAME (CT-13R28W)	
101F	735WPAA498	BUTTON,BASE (CT-13R18B)	
	735WPAA495	BUTTON,BASE (CT-13R38S)	
	735WPAA499	BUTTON,BASE (CT-13R28W)	
102	702WPAA391	CABINET,BACK ASSY (CT-13R18B, CT-13R38S)	
	702WPBA091	CABINET,BACK (CT-13R28W)	
103	7230006755	SHEET,CAUTION	
104	800WR0A011	SHEET,CRT SUPPORT (D)	
105	726000A041	SHEET,CRT NO.	
---	724576A003	MODEL,NUMBER STICKER (CT-13R18B)	
	724576A004	MODEL,NUMBER STICKER (CT-13R38S)	
	724576A005	MODEL,NUMBER STICKER (CT-13R28W)	
---	TQB2AA0490	INSTRUCTION BOOK(E)	J3M11001A
---	TQB2AA0491	INSTRUCTION BOOK(S)	J3M11010A

ELECTRICAL REPLACEMENT PARTS LIST

Location No.	Part No.	Description	Reference No.
		RESISTORS	
R001	R002T2153J	RC 15K OHM 1/2W	
R002	R002T2153J	RC 15K OHM 1/2W	
R003	R801R7101J	RC 100 OHM 1/10W	
R004	R801R7101J	RC 100 OHM 1/10W	
R101	R801R7561J	RC 560 OHM 1/10W	
R102	R801R7102J	RC 1K OHM 1/10W	
R103	R801R7102J	RC 1K OHM 1/10W	
R104	R801R7105J	RC 1M OHM 1/10W	
R105	R801R7472J	RC 4.7K OHM 1/10W	
R106	R801R7472J	RC 4.7K OHM 1/10W	
R107	R801R7101J	RC 100 OHM 1/10W	
R108	R801R7101J	RC 100 OHM 1/10W	
R109	R002T4103J	RC 10K OHM 1/4W	
R110	R002T4103J	RC 10K OHM 1/4W	
R112	R002T4222J	RC 2.2K OHM 1/4W	
R113	R002T4222J	RC 2.2K OHM 1/4W	
R115	R801R7223J	RC 22K OHM 1/10W	
R116	R801R7222J	RC 2.2K OHM 1/10W	
R119	R002T4223J	RC 22K OHM 1/4W	
R120	R002T4471J	RC 470 OHM 1/4W	
R122	R801R7103J	RC 10K OHM 1/10W	
R124	R801R7103J	RC 10K OHM 1/10W	
R125	R801R7473J	RC 47K OHM 1/10W	
R126	R801R7272J	RC 2.7K OHM 1/10W	
R127	R801R7102J	RC 1K OHM 1/10W	
R128	R801R7561J	RC 560 OHM 1/10W	
R129	R801R7473J	RC 47K OHM 1/10W	
R130	R002T4103J	RC 10K OHM 1/4W	
R143	R801R7470J	RC 47 OHM 1/10W	
⚠ **R401**	**R4X5T6273F**	**R,METAL 27K OHM 1/6W**	
R403	R002T4103J	RC 10K OHM 1/4W	
R404	R615U2680J	R,FUSE 68 OHM 1/2W	
R405	R002T4102J	RC 1K OHM 1/4W	
⚠ **R408**	**R4X5T6103F**	**R,METAL 10K OHM 1/6W**	
⚠ **R409**	**R4X5T6273F**	**R,METAL 27K OHM 1/6W**	
R410	R002T2331J	RC 330 OHM 1/2W	
R413	R002T2222J	RC 2.2K OHM 1/2W	
R415	R002T2182J	RC 1.8K OHM 1/2W	
R416	R002T2010J	RC 1 OHM 1/2W	
R417	R002T4103J	RC 10K OHM 1/4W	
R418	R002T4223J	RC 22K OHM 1/4W	
R419	R801R7471J	RC 470 OHM 1/10W	
R420	R801R7272J	RC 2.7K OHM 1/10W	
R421	R002T4224J	RC 220K OHM 1/4W	
R422	R002T22R2J	RC 2.2 OHM 1/2W	
R423	R002T4101J	RC 100 OHM 1/4W	
R424	R002T4471J	RC 470 OHM 1/4W	
R427	R002T4101J	RC 100 OHM 1/4W	
⚠ **R429**	**R635814R7J**	**R,FUSE 4.7 OHM 1W**	
R445	R002T4184J	RC 180K OHM 1/4W	
R446	R002T2471J	RC 470 OHM 1/2W	
R447	R3X28A151J	R,METAL OXIDE 150 OHM 2W	
R448	R002T2561J	RC 560 OHM 1/2W	
R449	R002T2561J	RC 560 OHM 1/2W	
⚠ **R500**	**R0G3K2275K**	**RC 2.7M OHM 1/2W**	
⚠ **R501**	**R5Y2CD5R6J**	**R,CEMENT 5.6 OHM 5W**	
R502	R002T4101J	RC 100 OHM 1/4W	
R503	R002T4101J	RC 100 OHM 1/4W	
R504	R002T4101J	RC 100 OHM 1/4W	
R505	R002T4102J	RC 1K OHM 1/4W	
R506	R002T4272J	RC 2.7K OHM 1/4W	
R507	R002T4270J	RC 27 OHM 1/4W	
⚠ **R508**	**R3X181221J**	**R,METAL OXIDE 220 OHM 1W**	
⚠ **R509**	**R002T4221J**	**RC 220 OHM 1/4W**	
R510	R002T4685J	RC 6.8M OHM 1/4W	
R512	R002T4681J	RC 680 OHM 1/4W	
R513	R002T4222J	RC 2.2K OHM 1/4W	
⚠ **R514**	**R63581R22J**	**R,FUSE 0.22 OHM 1W**	
⚠ **R515**	**R002T2124J**	**RC 120K OHM 1/2W**	
R516	R002T4103J	RC 10K OHM 1/4W	
⚠ **R517**	**R3X181010J**	**R,METAL OXIDE 1 OHM 1W**	
⚠ **R518**	**R4X5T6562F**	**R,METAL 5.6K OHM 1/6W**	
⚠ **R519**	**R002T4122J**	**RC 1.2K OHM 1/4W**	
R520	R002T4123J	RC 12K OHM 1/4W	
R522	R002T4685J	RC 6.8M OHM 1/4W	
R523	R002T4473J	RC 47K OHM 1/4W	
R525	R3X18A1R2J	R,METAL OXIDE 1.2 OHM 2W	
R527	R002T4562J	RC 5.6K OHM 1/4W	
R528	R002T4682J	RC 6.8K OHM 1/4W	
R530	R002T4274J	RC 270K OHM 1/4W	
R533	R801R7105J	RC 1M OHM 1/10W	
R534	R801R7103J	RC 10K OHM 1/10W	
R535	R801R7103J	RC 10K OHM 1/10W	
R537	R002T2223J	RC 22K OHM 1/2W	
R538	R002T2155J	RC 1.5M OHM 1/2W	
⚠ **R542**	**R3X181R68J**	**R,METAL OXIDE 0.68 OHM 1W**	
R601	R002T4822J	RC 8.2K OHM 1/4W	
R602	R002T4101J	RC 100 OHM 1/4W	
R603	R002T2121J	RC 120 OHM 1/2W	
R604	R002T4101J	RC 100 OHM 1/4W	
R605	R002T2221J	RC 220 OHM 1/2W	
R606	R002T4223J	RC 22K OHM 1/4W	
R607	R002T4101J	RC 100 OHM 1/4W	
R608	R002T4102J	RC 1K OHM 1/4W	
R609	R801R7124J	RC 120K OHM 1/10W	
R610	R801R7682J	RC 6.8K OHM 1/10W	
R611	R002T4103J	RC 10K OHM 1/4W	
R613	R002T4101J	RC 100 OHM 1/4W	
R614	R002T4101J	RC 100 OHM 1/4W	
R615	R002T4101J	RC 100 OHM 1/4W	
R616	R002T4102J	RC 1K OHM 1/4W	
R617	R002T4473J	RC 47K OHM 1/4W	
R618	R801R7223J	RC 22K OHM 1/10W	
R620	R002T2222J	RC 2.2K OHM 1/2W	
R621	R002T4221J	RC 220 OHM 1/4W	
R627	R801R7103J	RC 10K OHM 1/10W	
R629	R3X28B220J	R,METAL 22 OHM 3W	
R701	R002T4680J	RC 68 OHM 1/4W	
R702	R801R7473J	RC 47K OHM 1/10W	
R703	R801R7821J	RC 820 OHM 1/10W	
R704	R801R7100J	RC 10 OHM 1/10W	
R802	R002T4272J	RC 2.7K OHM 1/4W	
⚠ **R803**	**R3X181153J**	**R,METAL OXIDE 15K OHM 1W**	
R804	R002T2272J	RC 2.7K OHM 1/2W	
⚠ **R805**	**R3X181153J**	**R,METAL OXIDE 15K OHM 1W**	
R806	R002T4272J	RC 2.7K OHM 1/4W	
⚠ **R807**	**R3X181153J**	**R,METAL OXIDE 15K OHM 1W**	
R809	R002T4472J	RC 4.7K OHM 1/4W	
R811	R002T4472J	RC 4.7K OHM 1/4W	
R813	R002T4331J	RC 330 OHM 1/4W	
R814	R002T4472J	RC 4.7K OHM 1/4W	
R815	R002T4331J	RC 330 OHM 1/4W	
R816	R002T4331J	RC 330 OHM 1/4W	
R1001	R002T4473J	RC 47K OHM 1/4W	
R1003	R801R7683J	RC 68K OHM 1/10W	
R1004	R801R7104J	RC 100K OHM 1/10W	
R1005	R801R7274J	RC 270K OHM 1/10W	
R1007	R002T2470J	RC 47 OHM 1/2W	
R1008	R801R7393J	RC 39K OHM 1/10W	
		CAPACITORS	
C001	ECUV1H103ZFG	CC 0.01 UF 50V F	CS0RF0414Z
C002	E02LT0102M	CE 1000 UF 6.3V	
C004	CQGTF04H4Z	CC 0.022 UF 50V F	
C007	CQGTB04H4K	CC 0.022 UF 50V B	
C101	ECUV1H103ZFG	CC 0.01 UF 50V F	CS0RF0414Z
C102	ECUV1H103ZFG	CC 0.01 UF 50V F	CS0RF0414Z
C103	E02LU2470M	CE 47 UF 16V	
C104	ECUV1H103ZFG	CC 0.01 UF 50V F	CS0RF0414Z
C105	ECUV1H471KBN	CC 470 PF 50V B	CS0RB04Q2K
C106	E50HU5010M	CE 1 UF 50V	
C107	ECUV1H221KBN	CC 220 PF 50V B	CS0RB04H2K
C108	ECUV1H102KBN	CC 0.001 UF 50V B	CS0RB0413K
C112	ECUV1H101JCG	CC 100 PF 50V CH	CS0RCH412J
C113	ECUV1H561KBN	CC 560 PF 50V B	CS0RB04S2K
C118	E50HU0101M	CE 100 UF 6.3V	
C123	E50HU3100M	CE 10 UF 25 V	
C401	E5EZTD010M	CE 1 UF 250V	
⚠ **C403**	**E02LT4471M**	**CE 470 UF 35V**	
C406	C0JTB05H2K	CC 220 PF 500V B	
C410	CQGTCH413J	CC 0.001 UF 50V CH	
⚠ **C414**	**E02LU4101M**	**CE 100 UF 35V**	
C417	E02LU3470M	CE 47 UF 25V	
⚠ **C418**	**E02LT3471M**	**CE 470 UF 25V**	
C420	C0PLRR7W2K	CC 820 PF 2KV R	

ELECTRICAL REPLACEMENT PARTS LIST

Location No.	Part No.	Description		Reference No.
CAPACITORS				
C422	P235W1154J	CMP	0.15 UF 100V MKT	
C423	CQGTCH4H2J	CC	220 PF 50V CH	
C427	E02LU5100M	CE	10 UF 50V	
C434	E02LU8220M	CE	22 UF 100V	
C435	E5EZT80R1M	CE	0.1 UF 100V	
C437	P4J7F3474J	CMPP	0.47 UF 250V PMS	
C440	P232W1103J	CMP	0.01 UF 100V MMTS	
⚠ **C443**	**P4N8FJ862H**	**CMPP**	**0.0086UF 1.25KV**	
⚠ **C446**	**E02LU5220M**	**CE**	**22 UF 50V**	
⚠ **C448**	**E0ELFD220M**	**CE**	**22 UF 250V**	
C501	CS0RB04W3K	CC	0.0082UF 50V B	
C502	C0JTB0513K	CC	0.001 UF 500V B	
⚠ **C503**	**C0JTB0513K**	**CC**	**0.001 UF 500V B**	
⚠ **C505**	**P2122B224M**	**CMP**	**0.22 UF 275V ECQUL**	
C506	CD39E0M13M	CC	0.001 UF 250V	
C507	E5EZT8100M	CE	10 UF 100V	
C508	CD39E0MQ3M	CC	0.0047UF 250V	
C509	P1F4T0473J	CP	0.047 UF 50V	
C510	CQGTF0415Z	CC	0.1 UF 50V F	
C511	E50HU5010M	CE	1 UF 50V	
C513	CQGTCH413J	CC	0.001 UF 50V CH	
C514	C0PLRR7W2K	CC	820 PF 2KV R	
⚠ **C515**	**E02L02222M**	**CE**	**2200 UF 16V**	
C516	E02LU5010M	CE	1 UF 50V	
C517	C0PLRR7W2K	CC	820 PF 2KV R	
C518	C0JTB05Q2K	CC	470 PF 500V B	
⚠ **C519**	**E02LT2102M**	**CE**	**1000 UF 16V**	
C521	E5EZFB101M	CE	100 UF 160V	
⚠ **C526**	**E02LFC221M**	**CE**	**220 UF 200V**	
C601	E50HU5010M	CE	1 UF 50V	
C602	CQGTF0415Z	CC	0.1 UF 50V F	
C603	ECUV1H220JC	CC	22 PF 50V CH	CS0RCH4H1J
C604	ECUV1H223ZF	CC	0.022 UF 50V F	CS0RF04H4Z
C605	E50HU5010M	CE	1 UF 50V	
C606	E02LU1101M	CE	100 UF 10V	
C609	ECUV1H103ZF	CC	0.01 UF 50V F	CS0RF0414Z
C610	E50HU0470M	CE	47 UF 6.3V	
C612	E50HU5010M	CE	1 UF 50V	
C614	E50HU5010M	CE	1 UF 50V	
C615	E50HU5010M	CE	1 UF 50V	
C616	E50HU5010M	CE	1 UF 50V	
C617	E02LU1101M	CE	100 UF 10V	
C620	CQGTB0414K	CC	0.01 UF 50V B	
C621	E02LU2470M	CE	47 UF 16V	
C622	E50HU5010M	CE	1 UF 50V	
C623	E50HU52R2M	CE	2.2 UF 50V	
C624	P235WE105J	CMP	1 UF 63V MKT	
C626	ECUV1H103ZF	CC	0.01 UF 50V F	CS0RF0414Z
C627	ECUV1H103ZF	CC	0.01 UF 50V F	CS0RF0414Z
C628	E50HU5010M	CE	1 UF 50V	
C629	ECUV1H103ZF	CC	0.01 UF 50V F	CS0RF0414Z
C630	E02LU1471M	CE	470 UF 10V	
C633	E50HU5100M	CE	10 UF 50V	
C808	CQGTCH4L2J	CC	330 PF 50V CH	
C809	CQGTCH4L2J	CC	330 PF 50V CH	
C810	CQGTCH4L2J	CC	330 PF 50V CH	
C819	C0JBB0713K	CC	0.001 UF 2KV B	
C1001	E50HU50R1M	CE	0.1 UF 50 V	
C1003	E50HU5010M	CE	1 UF 50V	
C1004	ECUV1H152KB	CC	0.0033UF 50V B	CS0RB04L3K
C1005	E50HU3100M	CE	10 UF 25 V	
C1006	E00NU2470M	CE	47 UF 16 V	
DIODES				
D001	D97U03301B	DIODE,ZENER	MTZJ33B T-77	
D403	D2WT011E10	DIODE,SILICON	11E1-EIC	
D404	MTZJ6.2BT-77	DIODE,ZENER	MTZJ6.2B T-77	D97U06R21B
⚠ **D405**	**D2WTAU02A0**	**DIODE,SILICON**	**AU02A-EIC**	
D406	D2WT011E10	DIODE,SILICON	11E1-EIC	
D408	D2WT011E10	DIODE,SILICON	11E1-EIC	
D409	D2WT011E10	DIODE,SILICON	11E1-EIC	
⚠ **D410**	**D2WTAU02A0**	**DIODE,SILICON**	**AU02A-EIC**	
D411	D2WTAU02A0	DIODE,SILICON	AU02A-EIC	
⚠ **D412**	**MTZJ5.1BT-77**	**DIODE,ZENER**	**MTZJ5.1B T-77**	**D97U05R11B**
D501	D2WXN40050	DIODE,SILICON	1N4005-EIC	
⚠ **D502**	**D2WXN40050**	**DIODE,SILICON**	**1N4005-EIC**	
⚠ **D503**	**D2WXN40050**	**DIODE,SILICON**	**1N4005-EIC**	
D504	D2WXN40050	DIODE,SILICON	1N4005-EIC	
⚠ **D505**	**D2WXB290S0**	**DIODE,SILICON**	**SB290S**	
D506	D97U01801B	DIODE,ZENER	MTZJ18B T-77	
D508	D1VT001330	DIODE,SILICON	1SS133T-77	
⚠ **D509**	**D97U01801B**	**DIODE,ZENER**	**MTZJ18B T-77**	
⚠ **D510**	**D2WXRU2AM0**	**DIODE,SILICON**	**RU2AM-EIC**	
D511	D1VT001330	DIODE,SILICON	1SS133T-77	
⚠ **D512**	**1SS133T-77**	**DIODE,SILICON**	**1SS133T-77**	
D513	D2WXB290S0	DIODE,SILICON	SB290S	
D514	D1VT001330	DIODE,SILICON	1SS133T-77	
D515	D1VT001330	DIODE,SILICON	1SS133T-77	
⚠ **D516**	**D2WXN49370**	**DIODE,SILICON**	**1N4937**	
D520	MTZJ5.1BT-77	DIODE,ZENER	MTZJ5.1B T-77	D97U05R11B
D521	D97U05R61B	DIODE,ZENER	MTZJ5.6B T-77	
D522	D1VT001330	DIODE,SILICON	1SS133T-77	
D528	D97U05R61B	DIODE,ZENER	MTZJ5.6B T-77	
D601	D97U06R81B	DIODE,ZENER	MTZJ6.8B T-77	

Location No.	Part No.	Description		Reference No.
DIODES				
D603	D1VT001330	DIODE,SILICON	1SS133T-77	
D604	MTZJ8.2BT-77	DIODE,ZENER	MTZJ8.2B T-77	D97U08R21B
D606	D2WT011E10	DIODE,SILICON	11E1-EIC	
D701	D97U06R81B	DIODE,ZENER	MTZJ6.8B T-77	
ICS				
IC101	I56F07094A	IC	OEC7094A	
IC199	A3M110A015	IC	S-24C02BDP-1A	
⚠ **IC401**	**I01TD55220**	**IC**	**AN5522**	
IC501	0002E00610	PHOTO COUPLER	LTV-817M-VB	
IC1001	I01DP75110	IC	AN7511	
TRANSISTORS				
⚠ **Q401**	**TD3Q021400**	**TRANSISTOR,SILICON**	**TT2140LS-YBC11**	
⚠ **Q402**	**TC5T01627Y**	**TRANSISTOR,SILICON**	**2SC1627_Y(TPE2)**	
⚠ **Q501**	**TJXG5NC500**	**FET**	**STP5NC50FP**	
⚠ **Q502**	**TCATC31980**	**TRANSISTOR,SILICON**	**KTC3198-AT(Y,GR)**	
Q503	TA3T016240	TRANSISTOR,SILICON	2SA1624-AA	
Q505	TAATA12660	TRANSISTOR,SILICON	KTA1266-AT(Y,GR)	
Q507	TCATC31980	TRANSISTOR,SILICON	KTC3198-AT(Y,GR)	
Q509	TNATB03005	COMPOUND TRANSISTOR	KRC102MAT	
Q510	TA3T1371A0	TRANSISTOR,SILICON	2SA1371(D,E)-AE	
Q511	TC3T029090	TRANSISTOR,SILICON	2SC2909(S,T)-AA	
Q601	TCAT032034	TRANSISTOR,SILICON	KTC3203_Y-AT	
Q602	TCAT032034	TRANSISTOR,SILICON	KTC3203_Y-AT	
Q603	TCAT032034	TRANSISTOR,SILICON	KTC3203_Y-AT	
Q606	TCAT032034	TRANSISTOR,SILICON	KTC3203_Y-AT	
Q607	TCATC31980	TRANSISTOR,SILICON	KTC3198-AT(Y,GR)	
⚠ **Q801**	2SC1473ATA	**TRANSISTOR,SILICON**	**2SC1473A-TA-(RQ)**	**TCKT1473A0**
⚠ **Q802**	2SC1473ATA	**TRANSISTOR,SILICON**	**2SC1473A-TA-(RQ)**	**TCKT1473A0**
⚠ **Q803**	2SC1473ATA	**TRANSISTOR,SILICON**	**2SC1473A-TA-(RQ)**	**TCKT1473A0**
COILS &TRANSFORMERS				
L401	021L75472J	COIL	4.7 MH	
⚠ **L501**	**029T00A7M1**	**COIL,LINE FILTER**	**1R5A102F20**	
⚠ **L503**	**028R140032**	**COIL,DEGAUSS**	**8R140032**	
L801	021673221K	COIL	220 UH	
T401	045009003J	TRANS,HORIZONTAL DRIVE	ETH09K14BZ	
⚠ **T502**	**0481291084**	**TRANSFORMER,SWITCHING**	**81291084**	
JACKS				
J702	060Q401077	RCA JACK	AV1-09D-3	
J703	060Q401076	RCA JACK	AV1-09D-4	
⚠ **J801**	**066F120018**	**SOCKET,CATHODE RAY TUBE**	**ISMS01S**	
J1001	060J121014	JACK,RCA,3.5	MSJ-035-12A_PC	
SWITCHES				
SW101	0504101T34	SWITCH,TACT	EVQ21505R	
SW102	0504101T34	SWITCH,TACT	EVQ21505R	
SW103	0504101T34	SWITCH,TACT	EVQ21505R	
SW104	0504101T34	SWITCH,TACT	EVQ21505R	
SW105	0504101T34	SWITCH,TACT	EVQ21505R	
P.C.BOARD ASSEMBLIES				
PCB010	A3M110G010	PCB ASS'Y	TMC573A	
PCB110	A3M110G110	PCB ASS'Y	TCC434A	
MISCELLANEOUS				
ANT001	125C104001	ANTENNA,ROD	HPAS-2S400	
B501	024HT03553	CORE,BEADS	W5RH3.5X5X1.0	
B504	024HT03553	CORE,BEADS	W5RH3.5X5X1.0	
⚠ **CD501**	**120R414903**	**CORD,AC BUSH**	**0R414903**	
⚠ **CP401**	**069S450089**	**CONNECTOR PCB SIDE**	**A1561WV2-A5P**	
⚠ **CP502**	**069S420110**	**CONNECTOR PCB SIDE**	**A1561WV2-2P**	
CP503	069W01001A	CONNECTOR PCB SIDE	003P-2100	
CP601	069E260659	CONNECTOR PCB SIDE	00_8283_0611_00_000	
CP801	069W010030	CONNECTOR PCB SIDE	TBS-X01X-A1	
CD101A	06CH013202	CORD,CONNECTOR	CH013202	
CD101B	06CH013203	CORD,CONNECTOR	CH013203	
CP802A	067U005049	WIRE HOLDER	B2013H02-5P	
CP802B	067U005049	WIRE HOLDER	B2013H02-5P	
CP803A	067U004029	WIRE HOLDER	B2013H02-4P	
CP803B	067U004029	WIRE HOLDER	B2013H02-4P	
⚠ **F501**	**081PC04005**	**FUSE**	**51MS040L**	
⚠ **FB401**	**043214039F**	**TRANSFORMER,FLYBACK**	**FNI-14B002**	
OS101	RPM7138H5	REMOTE RECEIVER	RPM7137-SH5	0773071005
S101	WBL6026038	FLAT CABLE AWM2468 AWG26	4C BLACK 260MM	
S102	WCL6834038	FLAT CABLE AWM2468 AWG26	5C GRAY 340MM	
SP1001	070C533008	SPEAKER	810-47-171	
⚠ **TH501**	**D8EE0B1400**	**DEGAUSS ELEMENT**	**B59203-S1060-B14**	
TM101	EUR7713020	TRANSMITTER (CT-13R38S/CT-1	EUR7713020	076G0GP010
TM101	EUR7713030	TRANSMITTER (CT-13R28W)	EUR7713030	076G0GP020
M001	UR77EC1303A	BATTERY COVER, EUR7713020		
M001	UR77EC1303B	BATTERY COVER, EUR7713030		
TU001	0163100002	RF UNIT	ENG36A01G	
⚠ **V801**	**098Q1404B2**	**CRT W/DY**	**A34AGT13X98(L)**	
X601	100CT3R505	CRYSTAL	HC-49/C	

RESISTOR

RC..... CARBON RESISTOR

CAPACITORS

CC..... CERAMIC CAPACITOR
CE..... ALUMI ELECTROLYTIC CAPACITOR
CP..... POLYESTER CAPACITOR
CPP..... POLYPROPYLENE CAPACITOR
CPL..... PLASTIC CAPACITOR
CMP..... METAL POLYESTER CAPACITOR
CMPL..... METAL PLASTIC CAPACITOR
CMPP..... METAL POLYPROPYLENE CAPACITOR

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